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*Anderson, J. R. and Steele, C. H.: Laryngoscope 58:1279, 1948 • Aycock, B. W.: J. Oklahoma M. A. 44:265, 1951 • Douglass, C. C.: Laryngoscope 58: 1274, 1948 • Long, P. H.: A-B-C's of Sulfonamide and Antibiotic Therapy, Philadelphia, W. B. Saunders, 1948, p. 152.

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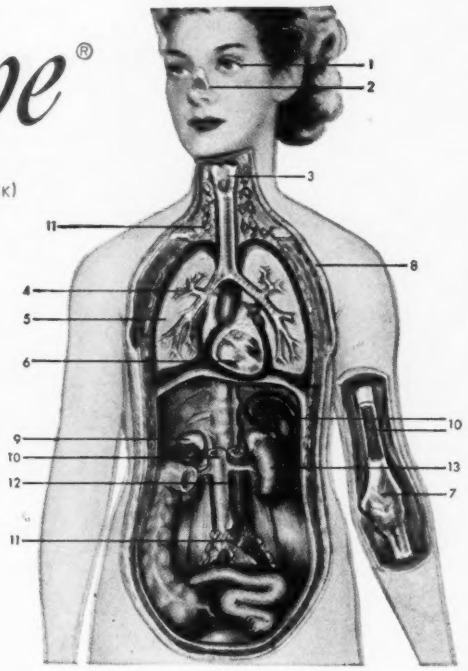

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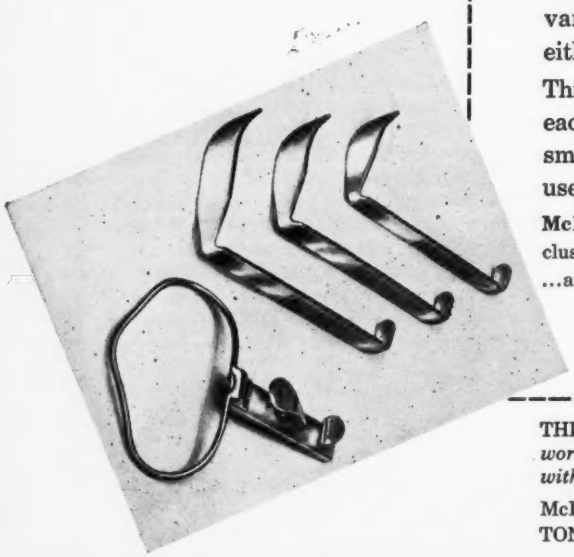

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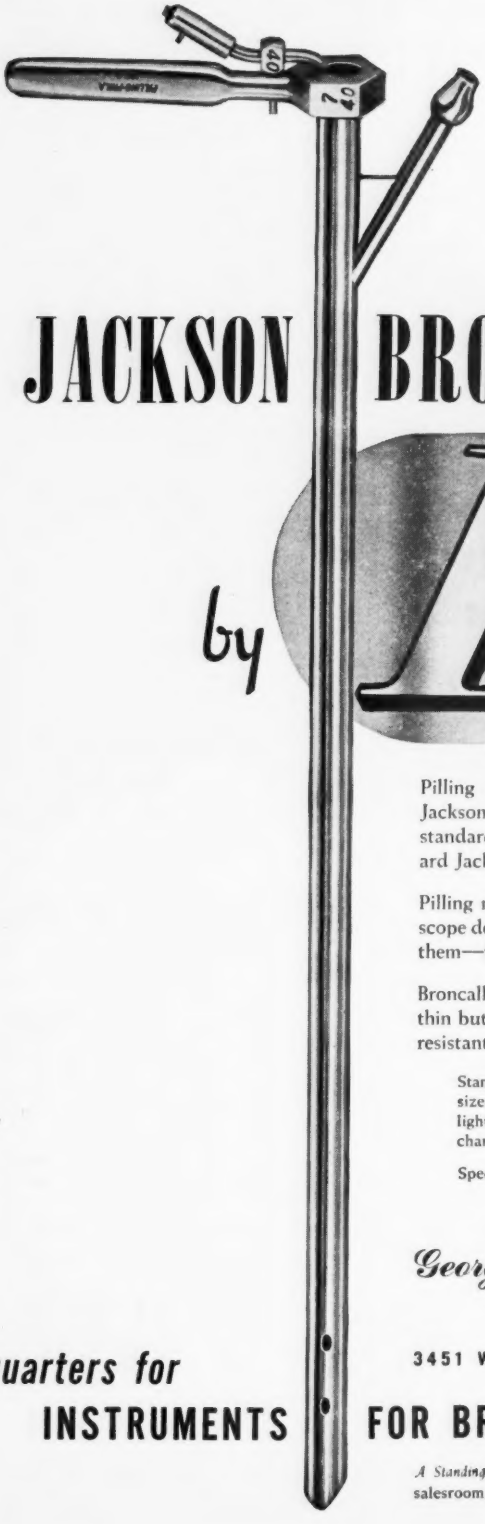

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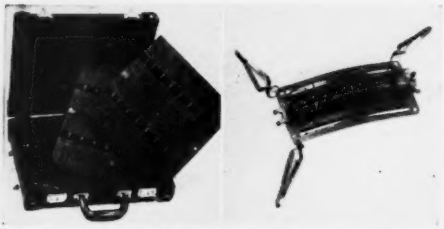

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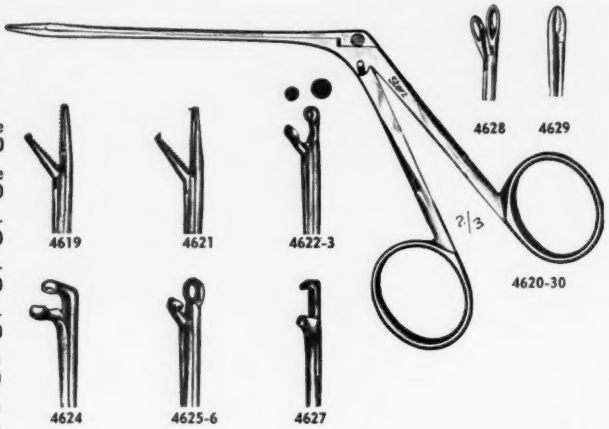

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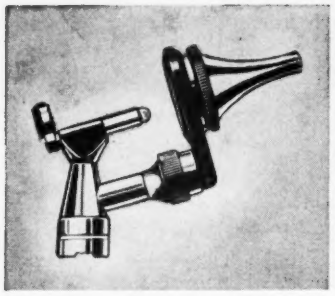

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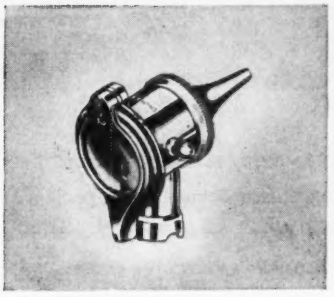

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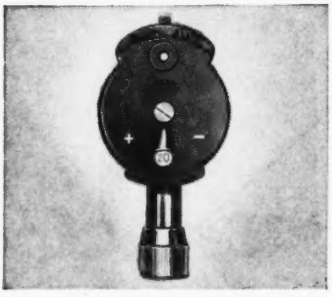

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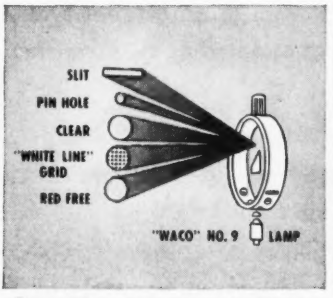

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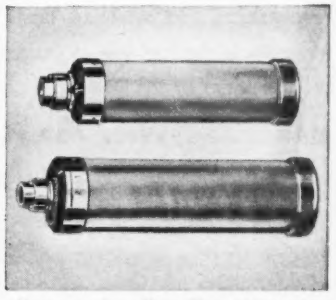

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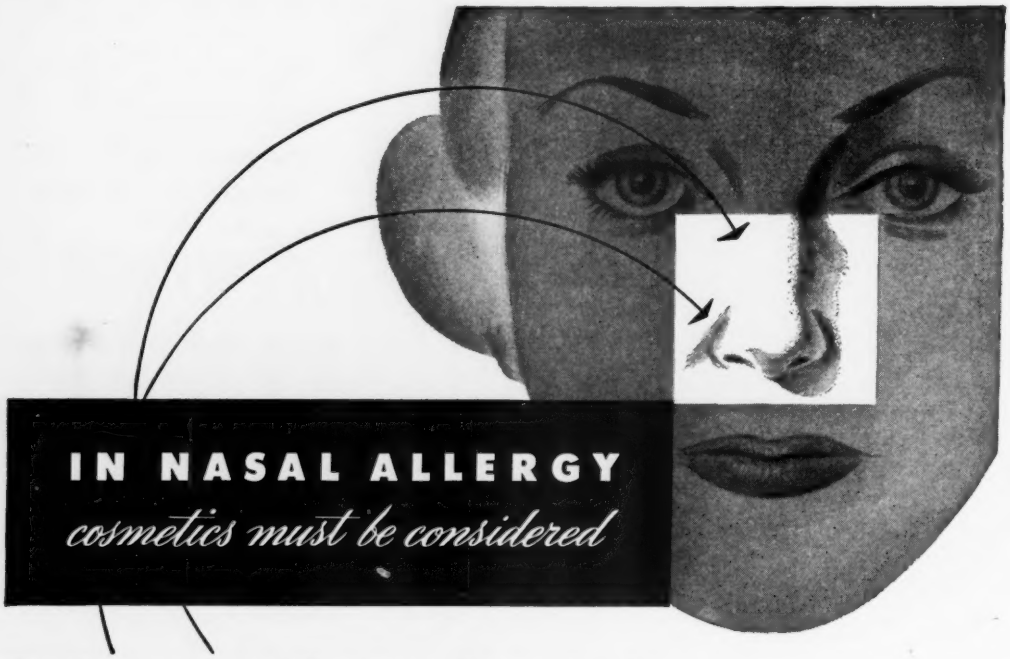

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LEE SHAHINIAN, M.D.
SAN FRANCISCO

VASOMOTOR rhinitis is probably the commonest nasal ailment, although the present concept of the term is relatively new. At the beginning of the century, individuals with chronic vasomotor nasal symptoms had their difficulty called chronic nasal catarrh, chronic hypertrophic rhinitis, or chronic hyperesthetic rhinitis. In the 1920's, these terms were to some extent put aside, when almost all common nasal ailments were believed to be one form or another of chronic rhinitis or chronic sinusitis. In the 1930's, there began a definite trend toward differentiating chronic vasomotor rhinitis and chronic nasal allergy from true chronic sinusitis caused by bacterial infection. More recently, particularly in the past decade, nasal allergy has been found to be actually one of a group of diseases which, individually or in combination, cause the nonspecific neurovascular phenomenon which we now describe as chronic vasomotor rhinitis.

The nose as an air-conditioning unit is charged with the triple duty of cleaning the air, moistening it to near saturation, and warming it to body temperature. The achievement of all three functions in the presence of varying environmental conditions requires intricate control of the vascular and glandular structures of the mucosa by the autonomic nervous system. Such control makes possible a wide range of erectile and contractile excursions by the nasal mucosa. Thus the airway space is rapidly reduced or enlarged. At the same time the glands of the nasal mucosa are stimulated to bathe the latter with the exact amount of moisture needed for conditioning the air at any given moment.

PATHOLOGY AND ETIOLOGY

The phenomenon of vasomotor rhinitis may be described as a nasal manifestation of disturbed systemic neurovascular physiology. It is characterized by exaggeration of the normal erectile and secretory actions of the nasal mucous membranes. Of all the mucosae covering the various nasal structures, that of the inferior turbinate has the richest supply of blood vessels. Hence the mucosa of this area presents the most noticeable reaction to the disturbed vasomotor state. Grossly, the appearance of this mucosa is one of bluish-colored intumescence. Histologically, examination of these turgescent tissues demonstrates marked engorgement of the vascular bed.

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If the congestion is long continued, there are varying degrees of superimposed edema, cellular infiltration, and fibrous changes. The tendency toward engorgement is partly influenced by gravitational factors, as evidenced by aggravation of the congestion according to the side on which the subject lies. The intumescent condition usually may be relieved by application of topical vasoconstricting agents, with resultant rapid but temporary improvement in nasal breathing space. Occasionally secondary edema and fibrous changes prevent this reversibility phenomenon. There is usually a concomitant increase of nasal secretions, which are swept posteriorly by ciliary action and cause the complaint of postnasal discharge. These excess secretions are relatively clear at the site of their secretion but may have a more mucopurulent character by the time they reach the nasopharynx. This is possibly due to differential speed of movement of the mucus and of the suspended cells. The mucus descends without difficulty to the pharynx and is swallowed with varying conscious awareness by the individual, as in the case of normal subjects. The cells, however, tend to lag and settle at the choana, to be cleared when the individual becomes aware of a perceptible collection. This awareness is in itself occasionally exaggerated in hypersensitive or hypochondriacal individuals who hawk and clear their throats excessively but expectorate relatively small amounts of secretion.

In different individuals the end-results of disturbed neurovascular physiology may be more pronounced in one bodily system than in others. Thus, in susceptible persons the respiratory mucosa responds with the characteristic vasomotor reaction. Various conditions are capable of causing such a disturbance. These may be outlined as follows: (1) chronic nasal allergy; (2) endocrine or metabolic dysfunction; (3) psychosomatic personality states; (4) miscellaneous factors, such as climatic or thermic conditions, and derangements of calcium and starch metabolism.

An extensive literature has appeared in the past two decades on the subject of allergic vasomotor rhinitis. Rhinologists are by now for the most part familiar with the concept of this disease. It is possible, however, that the range of vasomotor nasal conditions covered by this diagnosis has begun to narrow. The diagnoses of endocrine vasomotor rhinitis [1] and of psychosomatic vasomotor rhinitis [2] are being applied to many of the vasomotor conditions previously ascribed to allergy.

These diseases appear to be unrelated, each disturbing the nasal neurovascular physiology in a different manner. One is forced, however, to consider the possibility that each of the apparently independent disturbances listed may be basically related. As was previously stated, the autonomic nervous system controls the vascular and glandular structures of the nasal mucosa. The function of the autonomic nervous

1. (*a*) Thorn, G. W.; Forsham, P. H.; Frawley, T. F.; Hill, J. R., Jr.; Roach, M.; Staehelin, D., and Wilson, D. L.: Medical Progress: Clinical Usefulness of ACTH and Cortisone, New England J. Med. **242**:783-793 (May 18); 824-834 (May 25); 865-872 (June 1) 1950. (*b*) Walsh, T.: Vasomotor Rhinitis, Laryngoscope **60**:360-367 (April) 1950. (*c*) Proetz, A. W.: Further Observations on the Effects of Thyroid Insufficiency on the Nasal Mucosa, ibid. **60**:627-633 (July) 1950.

2. Holmes, T. H.; Goodell, H. S.; Wolf, S., and Wolff, H. G.: The Nose: An Experimental Study of Reactions Within the Nose in Human Subjects During Varying Life Experiences, Charles C Thomas, Publisher, Springfield, Ill., 1950. Selye, H.: The Physiology and Pathology of Exposure to Stress: A Treatise Based on the Concepts of the General-Adaptation-Syndrome and the Diseases of Adaptation, Acta, Inc., Montreal, Canada, 1950, pp. 686-687.

system is in turn intimately associated with that of the endocrine-hormonal system. For many years the role of endocrine dysfunction has been demonstrated in the changes brought about in specific and nonspecific vasomotor states by the use of adrenal, thyroid, gonadal, pituitary, and other endocrine substances. The recent dramatic investigations with cortisone [1a] further suggest the probability that the endocrine-hormonal system may be the underlying common denominator which exerts a strong influence in all cases. Supporting this thesis are the definite changes frequently noted in all vasomotor conditions during endocrine transitions such as puberty, childbirth, and menopause.

Similarly, marked alteration of vasomotor states by psychological factors is well known. Here again the endocrine-hormonal system may be the important intermediary. Physiologists have long been aware of the effects of emotional states on hormonal production. The simplest example is the effect on the heart rate by the outpouring of epinephrine into the blood stream of frightened or angered individuals. The definite proof of one type of endocrine mobilization phenomenon by psychological stress forces one to consider the probability that the secretion of other endocrine glands can be modified by various life stresses.

VARIOUS METHODS OF TREATMENT

The ideal treatment of chronic vasomotor rhinitis should be directed toward correction of the etiological factor in any given case. However, accurate determination of the cause is not always a simple matter. Not infrequently, chronic vasomotor rhinitis involves an admixture of several of the various factors listed above. Again, the complex nature of allergies, endocrine dysfunctions, and psychological-stress states makes it difficult in many cases to apply adequate treatment even when only one of the three conditions is present. Hence the three possible end-results in the attempted treatment of chronic vasomotor rhinitis can be stated as follows: first, the etiology may be found and remedied; second, the etiology may be found, but attempts at therapy may be ineffectual; third, the etiology may not be found.

When dealing with cases in the last two groups, the rhinologist must often resort to some form of nonspecific local therapy to provide relief. In considering any such treatment, it behooves the careful physician not to use local therapy which might cause irreversible and undesirable changes in nasal physiology. The list of various local treatments which have been used over a period of several decades includes the use of topical vasoconstricting agents, turbinectomy, submucous surgical scarification, zinc ionization, galvanocauterization, chemical cauterization, pure phenol applications of silver preparations, submucosal injection of sclerosing agents, medical diathermy, and submucous diathermic coagulation. It is not within the scope of this paper to present a critical analysis of these various methods, with the exception of the last named, but a brief review of their present status might be in order. Some are satisfactory in varying degrees; most are relatively unsatisfactory. Topical vasoconstrictors give a relatively short period of relief. Their effect diminishes if they are used over a period of time, the use of increasingly large doses thus being required. Occasionally, unpleasant end-results occur, such as marked vasoparalysis [3]

3. Wright, R. W.: Nasal Sensitivity to Vasoconstrictors, Arch. Otolaryng. **46**:330-334 (Sept.) 1947.

or anosmia.[4] The vasoparalysis can usually be relieved by stopping use of the medication, but the anosmia frequently remains. Turbinectomy, particularly total turbinectomy, may give respiratory relief, but the latter is too frequently offset by such unpleasant secondary sequelae as stagnation of secretions, crusting and nasal neuralgias. On the other hand, submucous resection of a turbinate [5] which has a marked element of bony hypertrophy can be of considerable value without risk of altering basic nasal physiology, provided that care is taken not to destroy nasal mucosa. Similarly, when a hypertrophic "mulberried" posterior inferior turbinate tip acts as a check valve, the surgical removal of this superfluous tissue results in improved nasal physiology as well as symptomatic relief. Submucous surgical scarification [6] is frequently efficacious, but the results are less consistent than those following the simpler procedure of submucous diathermic coagulation. Zinc ionization offers a significant degree of relief in a certain proportion of cases and is strongly supported by some workers.[7]

Galvanocauterization is favored by many rhinologists. It is one of the oldest of the local procedures and is still probably the most widely used of the list. Among the objections to galvanocauterization are the surface eschar formation, the slow healing which follows carbonization or burning of living tissues, and the occasional complication of secondary hemorrhage or turbinate slough. Post-treatment discomfort is not uncommon, possibly because of infection in the locally devitalized tissues. Chemical cauterization either with trichloroacetic acid by a chromic bead or with similar agents produces satisfactory results by more or less the same mechanism as does galvanocauterization, but it is subject to some of the same objections. Pure phenol applications [8] also offer relief of moderate duration. However, the postapplication discomfort and the risk of damage to ciliary physiology by repeated treatments make the procedure not one of choice. Local applications of silver preparations require multiple treatments and give only short-term relief. Submucosal injection of sclerosing agents, such as sodium morrhuate or sodium psylliate (Sylnasol), gives relief in selected cases [9] but offers some technical difficulties. If more than one needle puncture is made in the mucosa at any one sitting, much of the injected fluid escapes, thus making it difficult to judge the amount administered. Hence only small areas may be treated accurately at any one time. Frequency of post-treatment discomfort is also a disadvantage. Medical (topical) diathermy offers moderate relief with adequate safety, but the duration of improvement is relatively short, making necessary repeated series of treatments, which discourage the patient because of the time and cost involved.

4. Kully, B. M.: The Use and Abuse of Nasal Vasoconstrictor Medications, J. A. M. A. **127**:307-310 (Feb. 10) 1945.

5. Freer, O. T.: The Inferior Turbinate: Its Longitudinal Resection for Chronic Intumescense, Laryngoscope **21**:1136-1144, 1911. Spielberg, W.: The Treatment of Nasal Obstruction by Submucous Resection of the Inferior Turbinate Bone, Laryngoscope **34**:197-203 (March) 1924.

6. Dutrow, H. V.: Conservative Surgical Treatment of Hypertrophic Rhinitis, Arch. Otolaryng. **21**:59-63 (Jan.) 1935.

7. Hollender, A. R.: Controversial Problems in Nasal Iontophoresis, Eye, Ear, Nose & Throat Month. **18**:103-105 (May) 1939.

8. Palmer, A.: The Effect of Phenol in Hyperesthetic Rhinitis with Tissue Study of the Nasal Mucosa, Ann. Otol. Rhin. & Laryng. **44**:25-32 (March) 1935.

9. Thacker, E. A.: Value of Fatty Acid Derivatives in Treatment of Chronic Obstructive Rhinitis, Ann. Otol. Rhin. & Laryng. **36**:336-353 (Sept.) 1942.

TREATMENT BY SUBMUCOUS DIATHERMY COAGULATION

In contrast with the foregoing treatments and their various limitations, submucous diathermic coagulation offers relief for long periods, ranging from 2 to 10 years. It is an office procedure, usually requiring one, occasionally two, treatments on either side of the nose, plus several check-up visits. If anesthesia is properly applied, there is little discomfort during the procedure. Practically all patients are completely ambulatory after treatment and continue with their daily routine. Little post-treatment discomfort is experienced other than a stuffy feeling for one to six days. Improved airway is obtained after approximately seven days, and healing is complete in most cases by the end of three weeks. Since the action is primarily submucosal, there is relatively little damage to the surface mucosa as compared with that when galvanocautery is applied to the surface. Whereas galvanocautery involves complete carbonization or burning of living tissue, submucous electrocoagulation is a fractional procedure in which the amount of physical action can be controlled to any degree. The submucous tissues are cooked but not necessarily burned, provided the operator uses due care.

In 1930, Joseph C. Beck [10] reported on his associate Guttman's method of treatment of intumescent inferior turbinate mucous membrane by means of intramural electrocoagulation. He described the use of a single-needle electrode, which was inserted submucously, whereupon the diathermic current was applied until blanching occurred at the point of insertion. He then removed the needle and reinserted it at other sites parallel to the original insertion and then repeated the process. He stated "The object that is desired to be obtained by intramural coagulation of the turbinates is to secure a decrease in volume of the soft tissues by incorporating in them a shrinking scar. In addition this scar, when produced, prevents turgescence if even the turbinal become engorged."

Shortly thereafter, Hurd,[11] in 1931, described the use of a bipolar or double-needle electrode. He pointed out that coagulation begins at the points of the needle and travels backward. The reason he gave for this phenomenon was that the distance between the needle tips was less than that between their shanks. He advised inserting the needles to a distance of several centimeters and applying current until a white blanch appeared between the needles at the site of puncture. Morrison [12] shortly thereafter reported a simple method of making a Hurd instrument, but did not enlarge on the technique of treatment. Jaros,[13] in 1933, described a flexible electrode for diathermic coagulation, but his was a surface rather than a submucous procedure.

Commercially produced double-needle electrodes modeled after Hurd's instrument have been available for many years and are in use by many rhinologists. Yet a review of the literature discloses no original papers on submucous electrocoagula-

10. Beck, J. C.: Pathology and Intramural Electrocoagulation of Inferior Turbinate, Ann. Otol. Rhin. & Laryng. **39**:349-363 (June) 1930.

11. Hurd, L. M.: Bipolar Electrode for Electrocoagulation of Inferior Turbinate, Arch. Otolaryng. **13**:442 (March) 1931.

12. Morrison, W. W.: Simple Double Needle Electrode for Electrocoagulation of Hypertrophied Inferior Turbinates, Arch. Otolaryng. **14**:620-621 (Nov.) 1931.

13. Jaros, J. F.: Electrocoagulation of Turbinates; Duoterminal Flexible Electrode, Arch. Phys. Therapy **14**:533-535 (Sept.) 1933.

tion since those of the early workers, until that of Richardson [14] in 1948. In his favorable review of the method he states. "In the many papers on vasomotor rhinitis that have been written in the past 18 years, electrocoagulation is seldom mentioned." Hence, though the method has been described and frequently recommended in texts, no new ideas have been reported, nor have there been any suggested modifications of the techniques or of the instrument as suggested by Beck and Hurd. This may be attributed to the fact that the method was quite adequate as originally conceived.

I have used fractional submucous electrocoagulation in a total of 412 cases over the past 12 years. It is the purpose of this paper to review the indications and contraindications for the procedure, review the mechanism of action, describe the potential complications and suggest methods for their avoidance, and to present a modified instrument designed to make the procedure a more precise one.

INDICATIONS FOR TREATMENT

Of the several outstanding symptoms of vasomotor rhinitis, that of impaired nasal breathing is most responsive to submucous diathermic coagulation. Prognosis is best for those cases with a marked intumescence which may be reversed with the application of topical vasoconstricting agents. Less dramatic benefit is obtained if secondary fibrous hypertrophic changes are present in the mucosa. These are best recognized by the relative irreversibility of the tissue changes when topical vasoconstrictors are applied.

Results are also less satisfactory when uncorrected secondary bony hypertrophy of the inferior turbinate exists. In such cases it is best first to perform a submucous resection (Fig. 1*B*) of the hypertrophied bony turbinate, taking care not to destroy mucous membrane. In some cases this procedure concomitantly reduces vasomotor intumescence because of the fact that the cavernous spaces are scarified. Hence, when this procedure is performed, it is best to wait several months before considering submucous diathermic coagulation, because the latter may not be necessary. The mechanism of the scarification reaction in these cases is analogous to the submucous surgical scarification advocated by Dutrow [6] in 1933.

There are some inferior turbinates which jut out toward the septum even though they are not hypertrophied. A wide inferior meatus is usually present. In these cases, it is best to follow Richardson's [14] suggestion of displacing the inferior turbinate (Fig. 1*D*) toward the nasoantral wall. It has been my practice first to mobilize the inferior turbinate by fracturing it toward the septum with a long nasal speculum and thereafter to displace it with the same instrument toward the nasoantral wall. A time interval of two weeks is thereafter allowed for healing before diathermic coagulation is performed.

Vasomotor rhinitis is present unilaterally in many cases in which there is a deviation of the anterior septum. For a while after the injury causing the deviation, the side opposite the bony obstruction has an excess amount of breathing space. Over a period of time there is frequently developed a compensatory vasomotor reaction of the inferior turbinate mucosa which reduces this excess space. The procedure of submucous diathermic coagulation is very successful in correcting this difficulty unless a bony hypertrophy of the inferior turbinate has developed as well.

14. Richardson, J. R.: Turbinate Treatment in Vasomotor Rhinitis, Laryngoscope **58**:834-847 (Aug.) 1948.

Should a submucous resection of the nasal septum be performed, the operative results can sometimes be disappointing because the septum in its new position impinges upon such a turbinate. In such cases either the turbinate may have to be displaced toward the nasoantral wall, as described in the preceding paragraph, or submucous resection of the turbinate had best be performed.

Other symptoms of vasomotor rhinitis are benefited by submucous diathermic coagulation to a considerably less degree than is nasal obstruction. The subjective annoyance of excess nasal secretions is frequently reduced in varying degrees, because the improvement of the nasal airway aids ventilation and increases the efficiency of sniffing and hawking. Thus the secretions have less tendency to lag, and the patient is less aware of their presence. Headaches, sneezing, and pruritus when present as outstanding symptoms are sometimes partially ameliorated, but the improvement is entirely unpredictable. For the most part, I am reluctant to advise submucous electrocoagulation unless the patient feels that the prospect of relief of nasal obstruction would in itself be sufficient reason for undergoing the procedure.

Local treatment of any sort should be withheld if the rhinologist fails to observe objective evidence of obstruction. The subjective complaint of impaired breathing

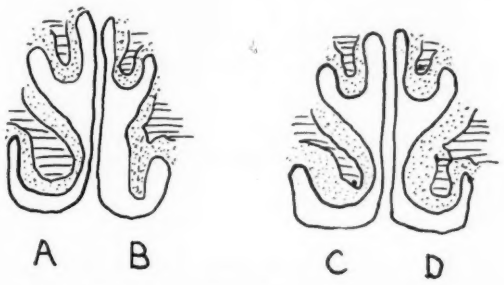

Fig. 1.—*A*, hypertrophy of inferior turbinate bone. Treatment applied to mucosa alone will not give significant increase in airway. *B*, submucous resection of inferior turbinate, with care not to destroy mucous membrane, is treatment of choice. *C*, medial jutting of inferior turbinate bone. *D*, inferior turbinate mobilized by first fracturing it toward septum, then displaced toward nasoantral wall. Time interval of two weeks is then allowed for healing before submucous diathermic coagulation is performed.

or nasal "stuffiness," in patients whose airway is obviously adequate when objectively examined is a sign either of nasal hypochondriasis or of nasal psychoneurosis. In the latter, the patient may actually have partial or complete anesthesia of the mucous membrane surfaces which interferes with the conscious measurement of air flow. One could not expect subjective relief of the "stuffy" sensation by increasing the already adequate airway of these patients.

In living tissue, such as that of the inferior turbinate mucosa, the intramural coagulation is in effect a partial destruction of tissue on a controlled basis. The process of healing replaces this destroyed area with fibroblasts which ultimately become fibrous tissue. This tissue, situated submucosally, has an action which can be compared to that of a "snubber" on an automobile spring, which limits but does not eliminate excursion. The turbinate is still capable of functioning as an air-conditioning unit, but any exaggerated excursion is limited by the fibrous "snubber" band in the submucosa (Fig. 2*A*).

PRECAUTIONS

The potential complications of the procedure are few but important. With proper precautions they may be either prevented or minimized. First, the current may be applied with too great intensity or with too long duration, with the risk of carbonization rather than fractional coagulation. This can result in sloughing and slow healing of the destroyed surface. The end-result for function may still be as good as that obtained with galvanocautery, but will be offset by the slow convalescence and other disadvantages of the latter method. Second, should the electrocoagulation be excessively severe, there is definite risk of turbinate slough, though this is more likely to result from malposition of the needle electrodes. Malposition can occur quite easily because the anterior edge of the turbinate bone is usually thin, and it is not unusual for the rhinologist inexperienced with this technique to allow one of the needle electrodes of the Hurd instrument to slip along the lateral or inferior meatus edge of the bone rather than alongside its mate on the septal side. When the coagulating current is thus applied through the bony plate (Fig. 2*D*), the resulting devitalization of this structure may cause the entire turbinate to slough.

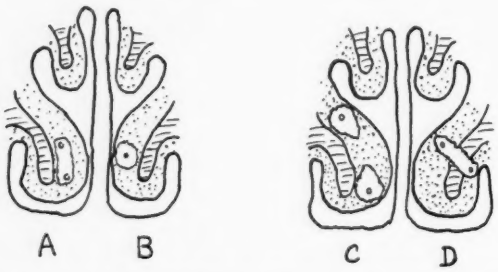

Fig. 2.—*A*, cross section of turbinate showing proper site of needle penetration and "ribbon" type of reaction area which gives maximum "snubbing" action with minimum risk of injury to surface mucosa. *B*, result of single-needle coagulation—cylinder-shaped area of reaction which extends toward mucosal surface as well as periosteum of turbinate bone. *C*, cross section of turbinate showing pear-shaped area of reaction which results when needles are placed too far apart. Injury to periosteum or mucosa is possible before an efficient "ribbon" of coagulation is obtained. *D*, result of malposition of electrodes. One of needles has slipped along lateral or inferior meatus side of inferior turbinate bone. Thus coagulating current is applied to either side of bony plate with resulting devitalization and possible slough of structure.

Third, secondary infection of the coagulated area occasionally occurs. This is usually due to overintense treatment, which causes devitalization of tissue to the extent that resistance to infection is lowered.

Complications can be avoided by precise placement of the needle electrodes followed by application of just sufficient coagulating current to cook that portion of the tissues between the needles without carbonizing them. In my opinion, the fixed needles of the Hurd instrument (Fig. 3) are not ideal for the achievement of this purpose for the following reasons. The physician has no control over the direction of the individual needles once they have penetrated the mucosa. The bony surface of the inferior turbinates is quite irregular; hence the needles when inserted simultaneously may tend to diverge or converge, depending on the variation of mechanical soft tissue or bony resistance met by each. Furthermore, the needles occasionally fail to maintain a uniform depth in the submucosa, and one or the other

may swing medially to repenetrate the surface mucosa and thus make an exit from the soft tissue. The disadvantages of needle convergence or divergence are readily apparent when experimental trials are made on raw beef (Fig. 4). A further disadvantage offered by the Hurd instrument is the poor vision afforded the rhinologist because of the large portion of the naris occupied by the handle of the instrument when the needles are fully inserted (Fig. 5). This also makes visual control of dosage difficult.

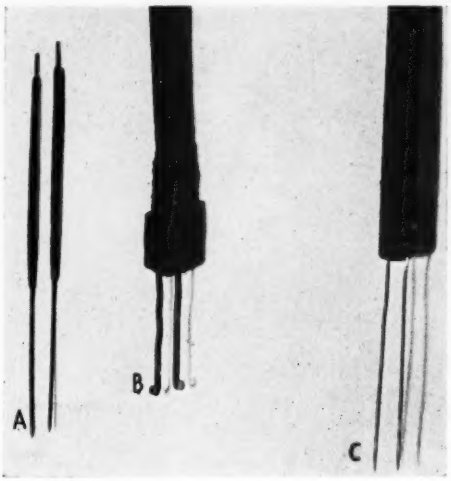

Fig. 3.—*A*, individual needles of modified instrument for submucous diathermic coagulation. *B*, handle of modified instrument. *C*, commercial model of Hurd instrument.

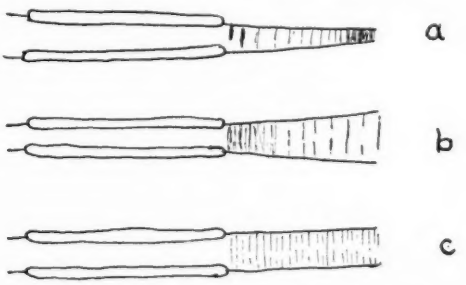

Fig. 4.—(*a*) Converging needles, which cause preponderance of reaction to occur at tips; this area may be severely carbonized before proximal area is adequately coagulated. (*b*) Diverging needles, which cause preponderance of reaction to occur at proximal portion of needles. (*c*) Parallel needles, which give homogenous reaction; optimum "ribbon" of coagulation is obtained when needles are approximately 6 mm. apart.

MODIFIED INSTRUMENT FOR SUBMUCOUS DIATHERMIC COAGULATION

One of the purposes of this paper is to present a modified instrument designed to circumvent the aforementioned difficulties. This intrument has individual needle electrodes which can be independently placed and a separate handle which allows unimpaired vision of the turbinate mucosa even when the needles are fully inserted (Fig. 6).

The needles are made of No. 0.026 spring steel wire in two lengths, 7.5 cm. and 10 cm., and are pointed at one end. These wires are covered with insulation over the central portion, with 3 cm. exposed at the pointed end and 0.25 cm. exposed at the opposite end (Fig. 3*A*). The original model of the handle (Fig. 3*B*) is still in use; it was made of two ribbon-shaped pieces of

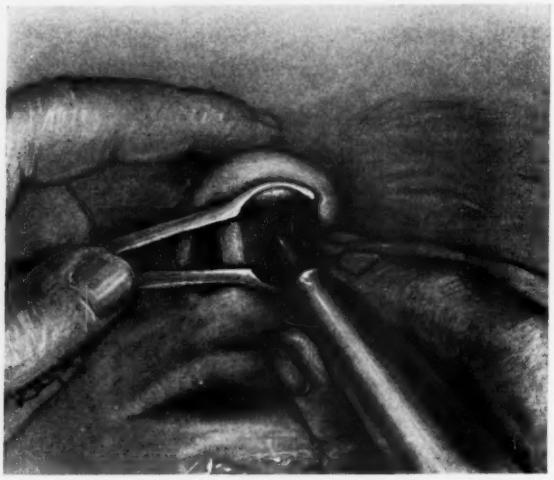

Fig. 5.—One of disadvantages of fixed double-needle instrument of Hurd type is poor vision afforded the physician owing to occupation of large part of naris by handle of instrument when needles are fully inserted. This difficulty is more pronounced in the right naris than in the left because the physician's hands are more in the way on the right side.

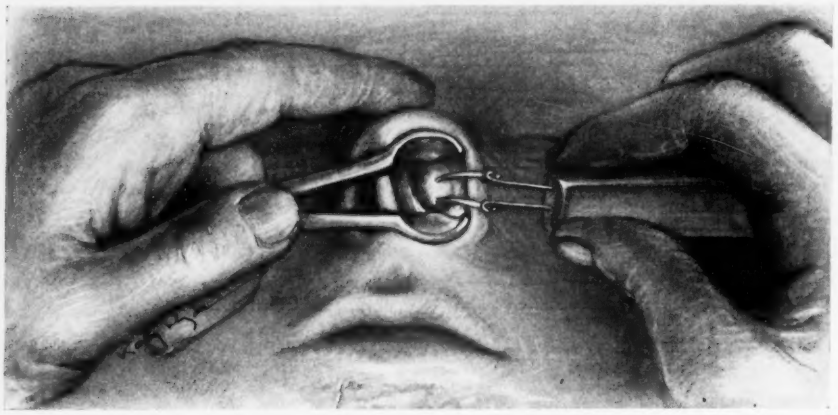

Fig. 6.—Modified instrument for submucous diathermic coagulation of vasomotor mucosa. Vision past electrode needle is in no way impaired by handle; in addition, slight lateral tension on handle causes arching of proximal insulated portion of electrode needles, thus moving them out of the way to allow still better view of turbinate mucosa.

wire from a bobby pin attached by linen cord winding to either side of an ordinary rubber extension cord, the wires of which had been exposed by scraping the rubber on the lateral surfaces. The free lengths of the bobby-pin wires are parallel and approximately 6 mm. apart. The tips were fashioned to form a circle with an inside diameter very slightly larger than the thickness

of the electrode needles. When the individual needle electrodes are placed in proper position in the turbinate mucosa, the handle is brought in at right angles and is attached by fitting the circular openings over the proximal uninsulated ends of the needle electrodes. It can be seen that the handle in no way interferes with vision (Fig. 6).

The diathermy current created by a spark gap apparatus is usually considered more desirable for the coagulating process than is that created by a radio tube apparatus. The former is a "rough" current, more suitable for coagulation, whereas the latter is usually of the "smooth" type, which is more suitable for cutting.

No physician should perform submucous coagulation of the inferior turbinate mucosa without first having familiarized himself with the physical results of the procedure on nonhuman tissue. Since the reaction of the diathermic coagulation in the vasomotor mucosa is roughly comparable to that in raw meat, experimentation on the latter type of tissue is desirable. The physician is at the same time enabled to calibrate this instrument for optimum current density and duration of current application.

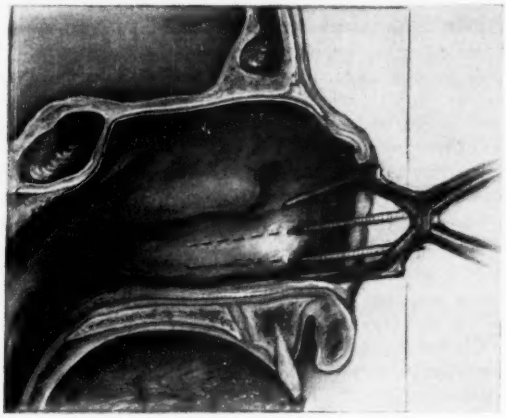

Fig. 7.—Lateral view of nose, showing position of electrode needles in turbinate mucosa. Direction of insertion is indicated by broken lines. For posterior intumescence, needles are introduced midposteriorly and threaded submucosally toward posterior tip.

EXPERIMENTS

Determination of Diathermy Reaction Characteristics of a Single-Needle Electrode

Experiment 1.—A piece of lean raw beef, free from gross fibrous tissue, measuring approximately 5 in. (13 cm.) square and ¾ in. (2 cm.) thick, makes a good specimen.

The indifferent electrode plate is placed under the meat. The uninsulated, pointed end of the single needle is placed on top of the meat, and pressure is made over this portion in order to obtain even contact. An arbitrary density setting of the diathermy machine is selected, and the active electrode is brought up to contact with the uninsulated, unpointed end of the needle. The current is now turned on. If the density setting is too low, no grossly noticeable reaction will occur for 10 seconds or more of current duration. If the intensity setting is too high, noticeable coagulation will occur in a fraction of a second. If current application is continued at this excessive intensity setting for a few seconds, the result is overcoagulation with an alarming sputter of boiling tissues. By empirical trials, a density setting is obtained which allows grossly perceptible coagulation to begin about the needle in approximately three seconds. The needle may then be moved to a fresh portion on the meat and the current applied for about six seconds. This should

result in a uniform area of coagulation extending 2 mm. to each side and below the needle electrode. Approximately six seconds has been empirically found to be a satisfactory minimum working time which allows adequate observation and control of the coagulation process.

EXPERIMENT 2.—The pointed end of the single-needle electrode is introduced into the meat, about 2 mm. below the surface and parallel to it. With use of the optimum intensity setting, as determined in Experiment 1, current is applied until blanching is noticeable through the translucent surface. Time of current application is noted. The needle is removed, the meat is sliced along the line of coagulation with a razor blade. The coagulation is seen to be a cylinder-shaped area resembling insulation about a wire (Fig. 2*B*). Deliberate trials of excess coagulation should also be made to familiarize the rhinologist with this undesired extreme of the procedure.

DETERMINATION OF DIATHERMY REACTION CHARACTERISTICS WITH DOUBLE-NEEDLE ELECTRODES

EXPERIMENT 3.—No indifferent electrode is used, as each of the needles is an active electrode. The uninsulated pointed end of the first needle is placed on top of the meat as in Experiment 1. The second needle is placed parallel to it, separated by a distance of 6 mm. The circle tips of the handle are inserted over the nonpointed ends, and the handle is slightly twisted to make contact. Tongue blade pressure is made on the needles, and current is applied. It is quickly apparent that noticeable tissue reaction will occur in less time than with the single needle at the same current density setting. Hence the latter must be somewhat reduced to avoid too rapid, uncontrollable reaction with the use of the double needles. Here again, a density setting should be selected which will give grossly noticeable initial reaction around each needle in about three seconds. Thereafter the needles are similarly repositioned in a fresh area, and current is allowed to flow for six seconds. It will be seen that the minimum reaction is one of a half cylinder distributed below and to the sides of each needle, whereas increase of the current duration causes the largest proportion of the coagulation action to occur between the needles. If the needles are perfectly parallel, this coagulation reaction is homogenous throughout the entire length.

EXPERIMENT 4.—The same procedure is followed as in Experiment 3, except that the needle tips are made to converge or diverge (Fig. 4). Coagulation reactions are seen to be proportionately imbalanced, with maximum action occurring at the region of closest approximation.

EXPERIMENT 5.—The procedure of Experiment 3 is followed, except that the needles are introduced parallel to the surface, as well as to one another, at a depth of 2 mm., separated by a distance of 6 mm. Current density should be the same as determined in Experiment 3. After suitable contact with the handle, current application is made in two-second spurts until blanching is noticeable through the surface. The total time of current application to achieve this result should be approximately six seconds. The needles are left in place, and a razor blade is used to slice through the area with the needles as a guide. It will be seen that the optimum reaction is one which causes an oval-shaped ribbon (Fig. 2*A*), extending about 2 mm. around each needle and bridging homogeneously between the two.

EXPERIMENT 6.—The procedure of Experiment 5 is followed, except that the needles are placed only 2 mm. apart instead of 6 mm. apart. Current is similarly applied. This results in a thin, short line of coagulation rather than a moderately thick, oval one. The total time of current application required to obtain this result is relatively short, possibly two seconds. The needles are then placed 12 mm. apart, and current is applied. Surface reaction is seen to occur, but when the tissue is sliced, as in Experiment 4, the reaction area is seen to be somewhat pear-shaped about each needle (Fig. 2*C*), and the connecting band is incomplete or absent. The total time of necessary current application is considerably longer than six seconds because of the increased space between the needles. Hence, if the needles are placed too far apart, surface damage may occur before the desired ribbon coagulation is obtained.

CONCLUSIONS FROM EXPERIMENTS

The best coagulation band is obtained when the needles are inserted as nearly parallel to one another as possible. Optimum reactions occur when the needles are approximately 6 mm. apart and the current density is such that the desired reaction

is complete in about six seconds. This is the approximate minimum time which allows adequate observation and control of the coagulation process. Control is best achieved by applying current in two-second spurts and observing the results before continuing. The coagulation reaction can be seen as a line of blanching between the points of insertion of the needles and as a ribbon of blanching through the translucent mucosa. The advantage of the double needle over the single needle is that an adequate ribbon-like reaction can be obtained, the largest proportion of the reaction being between the two needles and parallel to the mucosal surface and to the turbinate bone, with minimum possibility of damage to either. With the single needle, the reaction is a purely cylindrical one which spreads equally toward the bone and the surface mucosa rather than parallel to these structures.

PROCEDURE

Patients are best treated in the recumbent position. This reduces apprehension and the possibility of fainting episodes. Anesthesia is produced by 10% cocaine applied to the inferior turbinate mucosa with small cotton packs. In addition, 0.5 cc. of 2% procaine hydrochloride is injected into the anterior tip of the turbinate just distal to the mucocutaneous line, because the topical cocaine does not satisfactorily anesthetize this area. Occasional brisk bleeding occurs from the region of the procaine needle puncture and should be completely stopped with cotton pressure before proceeding. This precaution is essential because a bloody field can seriously interfere with the physician's ability to evaluate the various stages of coagulation reaction. The superior needle electrode is introduced first. Proper position in the submucosa is insured by a series of alternating maneuvers designed to keep the needle deep in the submucosa, about 2 mm. from the bone, and parrallel to the bone and to the mucosal surface. The needle is first made to penetrate the mucosa of the inferior turbinate approximately 2 mm. distal to the mucocutaneous line, at an acute angle, until contact is made with bone; then it is very slightly withdrawn and threaded submucosally for several millimeters, then angled toward the turbinate bone for redetermination of position, slightly withdrawn, and threaded submucosally for several additional millimeters, until the full 3 cm. of the uninsulated portion of the needle is buried. The inferior needle is similarly introduced 6 mm. below and parallel to the first needle (Figs. 5, 6 and 7), with care not to slip over on the lateral or inferior meatus side of the turbinate (Fig. 2).

After the electrode needles are thus introduced into the intumescent turbinate mucosa, parallel to one another and about 6 mm. apart, the handle is brought in at right angles to the proximal or protruding ends of the electrodes. The circular openings of the handle tips are then allowed to drop over the proximal uninsulated ends of the electrodes (Fig. 6). A slight mechanical locking effect and good electrical contact are then insured by twisting the handle very slightly after it is in proper position. It can be seen that vision past the electrode needles is in no way impaired by the handle. Furthermore, by slight lateral tension on the handle, the insulated portion of the electrode needles can be slightly arched, as shown in the illustration, thus moving them out of the way to allow still better vision of the turbinate mucosa being treated.

Current density setting should be made to correspond to that determined in meat trials to give adequate coagulation reaction in about six seconds of current application.

Current is now applied by pressure on the foot switch in spurts of two seconds each. The surface of the mucosa overlying the needles is kept under constant observation, during and between these spurts of current application, as is also the region between the needles at the position of their insertion. The coagulation reaction can be seen as a line of blanching between the points of insertion of the needles into the mucosa and as a ribbon of blanching through the translucent mucosa. If a minimum perceptible ribbon reaction is discernible after the first one or two two-second spurts of current application, it is usually safe to continue for one more similar application. These figures are presented as suggestions and are at best approximate. The skillful determination of optimum coagulation end-point is best achieved by experience.

Post-treatment bleeding is rare. No pack or local medication is applied. The patient is told that his nose will be congested 3 to 10 days and is asked not to blow his nose hard or pick at the crusts. Discomfort occasionally experienced in the first 24 hours is readily controlled with acetylsalicylic acid. Patients are observed at once-weekly intervals, and loose crusts if present are removed. Healing is usually complete at the end of three weeks.

RESULTS

The method and instrument described in the preceding paragraphs have been used by the author on a total of 412 patients during the past 12 years. The majority of these were individuals for whose vasomotor difficulties no specific cause had been found. In addition, there were significant minority representations of patients with the following difficulties: (1) perennial allergies in which only partial or no relief was obtained with trials of specific therapy; (2) manifest endocrine dysfunctions in which attempts at specific therapy gave partial or no relief (included in this group were three relatively acute cases of severe, intractable vasomotor rhinitis of pregnancy which had been refractory to various other forms of therapy; relief in these cases was dramatic); (3) psychosomatic vasomotor rhinitis in which a vicious cycle was created when the nasal obstruction caused an increase of nervous tension; (4) compensatory unilateral vasomotor rhinitis associated with a deviated nasal septum. The coagulation procedure in the last group of cases was usually an auxiliary to the primary procedure of submucous resection of the nasal septum.

Need for repeated treatments was infrequent. Six of the patients required an additional coagulation treatment on an average of two years after their first treatment. All recurrences in this series were in patients whose vasomotor rhinitis was of the severe allergic type. Of course, it must be assumed that there may have been additional patients with recurrences who failed to return for additional care.

The youngest patient to be treated was a 9-year-old boy who had had no useful nasal breathing within his family's memory. Excellent results were obtained by a combination of submucous diathermic coagulation of the anterior inferior turbinate mucosa plus the extirpation of hypertrophic posterior inferior turbinate tips with a nasal snare activated with a diathermic coagulation current to minimize bleeding.

It is not the intent of this paper to advocate the exclusive use of double-needle submucous diathermic coagulation in the local treatment of chronic vasomotor rhinitis. I have made use of various other treatment methods as auxiliary aids to this procedure. Occasionally, areas of intumescence are best treated with a single-needle electrode, the inactive plate being held in the patient's hand. Hypertrophied posterior inferior turbinate tips, as mentioned above, are best removed with a long, delicate, insulated nasal snare, activated with a diathermic coagulation current to

minimize bleeding. In some cases of posterior intumescence which are not suitable for use of this snare, a chromic bead, sheathed with a protective tube to prevent contact with the septum, is carried posteriorly and is streaked across the desired area.

Satisfactory results are impossible in some cases unless septal deformities are properly corrected by a submucous resection procedure. In others submucous resection of a turbinate with bony hypertrophy or displacement of the latter toward the nasoantral wall may be required.

Except for a few poorly chosen cases early in the series, the results obtained by submucous diathermic coagulation have been gratifyingly successful. In none of the cases did post-treatment turbinate slough or secondary atrophic rhinitis develop. Post-treatment infection occurred in six cases, in each of which it cleared rapidly with administration of systemic chemotherapy for several days.

SUMMARY AND CONCLUSIONS

A review of the present status of chronic vasomotor rhinitis is presented, together with the postulation that this disease-complex is a local nasal manifestation of disturbed systemic neurovascular physiology. It is further possible that the endocrine-hormonal system may be of etiological importance by its action as the underlying common denominator which exerts a strong influence in all cases. Since attempts at therapy by correction of etiological factors are not always successful in relieving nasal obstruction, the physician must resort to some form of local therapy for relief. I believe that the procedure of submucous diathermic coagulation is one of the best of the local treatment methods. A historical review of the procedure is presented, together with a discussion of the following: indications and contraindications for treatment; mechanism of action, and potential complications and methods for their avoidance. A series of experiments is outlined for the purpose of aiding the physician in calibrating his diathermy instrument and familiarizing himself with the method. The use of a modified instrument, designed to make the procedure a more precise one, is described. Results of treatment are briefly reviewed.

DL DIFFERENCE TEST

Improved Method for Clinical Measurement of Recruitment

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THE RECRUITMENT of loudness phenomenon, first described by Fowler,[1] has been known for over two decades, but its practical significance has only recently been discovered. Otologists have long recognized that certain patients experience an abnormally rapid increase in loudness when the intensity of sound is raised above their impaired threshold, but for many years it was thought that this recruitment was the inevitable accompaniment of all perceptive, as opposed to conductive, hearing loss.

The discovery by Dix, Hallpike, and Hood[2] that recruitment is present only in lesions of the sensory receptor mechanism, i. e., hair cells and organ of Corti, has, in general, precipitated a renewed interest in this remarkable phenomenon, and, in particular, has emphasized the need for a simple, easily administered test of recruitment for clinical purposes. It has been recognized that such a tool would constitute a valuable addition to the otologist's armamentarium by allowing him to differentiate perceptive losses due to cochlear pathology from perceptive losses due to retrocochlear (eighth nerve or central) pathology.

In general, recruitment tests may be divided into two categories, the direct methods and the indirect methods.

The direct methods are theoretically more desirable but clinically less satisfactory because of the limitations they impose on the kinds of cases in which they can be used. The two most commonly used direct methods are Fowler's alternate binaural loudness balance test[3] and Reger's monaural equal loudness contour technique.[3]

Fowler's test can ordinarily be used only in patients with unilateral loss. It is administered by presenting a tone first to one ear, then to the other, at various levels above the threshold of the normal ear. At each level the intensity of the tone on the impaired ear is varied until the patient judges that it is equal in loudness to the tone on the normal ear. Recruitment is demonstrated if a given increase in intensity produces a greater increase in the subjective loudness sensation in the impaired ear than in the normal ear.

From Northwestern University.

1. Fowler, E. P.: Marked Deafened Areas in Normal Ears, Arch. Otolaryng. **8**:151-155, 1928.

2. Dix, M. R.; Hallpike, C. S., and Hood, J. D.: Observations upon the Loudness Recruitment Phenomenon with Especial Reference to the Differential Diagnosis of Disorders of the Internal Ear and Eighth Nerve, J. Laryng. & Otol. **62**:671-686, 1948.

3. Watson, L. A., and Tolan, T.: Hearing Tests and Hearing Instruments, Baltimore, Williams & Wilkins Company, 1949.

Reger's technique does not require a normal ear, but it does demand that at least one frequency be unimpaired. Tones of two frequencies, one impaired, the other unimpaired, are alternately presented to the same ear. The patient is required to equate the loudness sensations produced. Recruitment is demonstrated if a given increase in intensity produces a greater increase in the subjective loudness sensation at the impaired frequency than at the unimpaired frequency.

Since the majority of patients with hearing loss seen by the practicing otologist have neither one normal ear nor one unimpaired frequency, the methods of Fowler and Reger fail to qualify as routine clinical tools.

For this reason many investigators have attempted to devise indirect recruitment tests of greater clinical value than the direct methods. With few exceptions, their search has been based on the discovery of a very interesting relationship.

Only a few years after Fowler's initial description of the recruitment phenomenon, it was found that recruitment was regularly accompanied by abnormally acute sensitivity to intensity change.[4] In other words, it was found that patients with recruitment could detect smaller change in intensity than persons with normal hearing. The pathological condition actually improved the patient's sensitivity to small intensity changes.

Most indirect tests of recruitment utilize this discovery. Instead of measuring the patient's subjective loudness sensation, they measure his ability to detect changes in intensity, and compare it with the ability of normal hearers. If the patient is able to detect smaller changes than a normal hearer would under the same conditions, recruitment is assumed to be present.

The nature and measurement of sensitivity to small changes have been a major concern of experimental psychology since the latter half of the last century. As a result, a valuable body of literature and many helpful concepts are available to the clinician. Psychologists use the term "difference limen" (i. e., threshold for the detection of a difference), usually abbreviated "DL," as the unit of measurement of differential sensitivity. With reference to the intensity of sound, the DL is the magnitude, in decibels, of the intensity change that the patient is just able to detect as a change in loudness. For example, a tone is presented to a patient at 30 db. above his threshold. Then the intensity of the tone is gradually increased, and the patient is instructed to signal when it has become just perceptibly louder. If he signals when the tone has reached 32 db. above threshold, then his DL under these circumstances is 2 db.

It has been found that the size of the DL is extremely dependent on the method by which it is measured. For this reason, the absolute sizes of the DL's can be compared only if they have been obtained by the same method. The above example illustrates only one of several methods that have been evolved in experimental psychology for the definition of the DL.

4. Brinitzer, W.: Die Unterschiedsempfindlichkeit für Lautstärken bei Gehörerkrankungen: Versuche mit dem Otoaudion, Monatsschr. Ohrenh. **69**:1301-1321, 1935. Neuberger, F.: Untersuchungen über den qualitativen Zusammenhang der Unterschiedsschwelle für Tonintensitätsänderungen und dem Lautstärkeausgleich (Recruitment Phenomenon), ibid. **84**:169-182, 1950. Reger, S. N.: Loudness Level Contours and Intensity Discrimination of Ears with Raised Auditory Thresholds, J. Acoust. Soc. America **7**:73, 1935.

Of the various techniques proposed for the clinical measurement of the DL, two methods would appear to offer the most promising possibilities as routine clinical tools, the method of Lüscher [5] and the method of Denes and Naunton.[6]

In the Lüscher method, the DL is obtained by producing periodic or cyclic variations in the intensity of a pure tone and determining the minimum intensity change necessary to produce the subjective sensation of an intensity beat. Lüscher measures the DL at a level 40 db. above the patient's threshold and compares it with the DL of the normal ear at that level. He finds that the normal DL at this level varies between 0.9 and 1.5 db. and considers that any DL below 0.54 db. is abnormally small, thus indicating the presence of recruitment.

The method of Denes and Naunton differs from the Lüscher technique in that no attempt is made to interpret the absolute size of the DL. Instead, DL's are obtained at two levels above threshold, at 4 and at 44 db. The presence of recruitment is inferred from the relationship between these two DL's. This procedure is based on the premise, supported by clinical evidence, that the effect of recruitment in an impaired ear is most pronounced at levels close to threshold. This results in a distortion of the normal size relationship between the DL's at the two levels. Denes and Naunton have found that patients without recruitment have a smaller DL at the 44 db. level than at the 4 db. level. But patients with recruitment have essentially the same DL at either level.

The method of Denes and Naunton further differs from the Lüscher technique in the manner in which the DL is measured. Two tones of identical frequency are alternately presented to the same ear with an interval of silence between the two. The intensity of one tone is fixed, the other variable. The DL is defined as the intensity difference between the two tones when the variable tone is just perceptibly "louder than" or "softer than" the fixed tone.

Critical examination of these two methods suggests that each has certain advantages and certain disadvantages in the clinical situation. The Lüscher technique has the advantage of simplicity and ease of administration. Its principal disadvantage, however, lies in the fact that patients show wide individual differences in their responses to this test because of differences in alertness, reaction time, etc. This rather pronounced variability tends to obscure abnormal deviations when the patient's performance is compared with a statistical norm.

The method of Denes and Naunton overcomes this difficulty by comparing a patient's performance at a level close to threshold with his performance at a level considerably above threshold. No attempt is made to compare his performance with an absolute norm. The presence or absence of recruitment is inferred from the relative sizes of the DL's at two levels in the same person. This provides an effective answer to the problem of individual differences. For example, a patient whose slow reaction time would tend to obscure the deviations of his DL's from a norm would presumably show the same reaction time for both suprathreshold measurements. Thus the relationship between the two DL's would be unaffected by his reaction time.

5. Lüscher, E.: The Difference Limen of Intensity Variations of Pure Tones and Its Diagnostic Significance, J. Laryng. & Otol. **65**:486-510, 1951.

6. Denes, P., and Naunton, R. F.: The Clinical Detection of Auditory Recruitment, J. Laryng. & Otol. **64**:375-398, 1950.

The Denes and Naunton technique is, however, somewhat more cumbersome to administer in clinical practice than the comparatively simple Lüscher method. Furthermore, the Lüscher method requires considerably less elaborate special equipment.

In view of these considerations, it was felt that a new test could be devised which would utilize the advantages of each method. Accordingly, a test procedure has been developed in which the DL is measured at two levels above threshold according to the Denes and Naunton method, but in which these DL's are actually obtained by the Lüscher technique.

This test procedure utilizes the best features of each technique: the Denes and Naunton method of comparing the patient with himself, and the simplicity of administration of the Lüscher method. It eliminates the disadvantages of each: the elaborate equipment and cumbersome method of administration of the Denes and Naunton technique, and the variability among patients which tends to obscure the interpretation of Lüscher test results.

METHOD OF ADMINISTRATION

In order to administer this new test, the clinician needs only a standard clinical audiometer and a special attachment for producing the periodic variation in the intensity of the pure tone.

TABLE 1.—*Average DL Difference (DL at 10 db. minus DL at 40 db.) for Five Frequencies, with Standard Deviation for Each Frequency*

	Frequency, Cps				
	250	500	1000	2000	4000
Ave. diff. (10 — 40)	1.24	1.03	0.93	0.87	0.93
Standard deviation	0.40	0.37	0.30	0.26	0.28

Such devices, called "amplitude modulators," are commercially available. The present research was carried out with an ADC 50E audiometer to which an Amplivox amplitude modulator had been appropriately coupled.

The new test is administered in the same manner as my previously described [7] modification of the original Lüscher technique, called the "DL test," in which the DL was measured at a level 15 db. above the patient's threshold. In the new method, two DL's are obtained: one at 10 db., the other at 40 db. above the patient's threshold. These DL's are measured in the following manner.

When the patient's threshold at a given frequency has been determined audiometrically, the hearing loss dial of the audiometer is set to a level 10 db. above threshold. Then, with the tone "continuously on," the periodic intensity variation is gradually introduced until the subject signals his awareness of an intensity beat. The average of three to five trials is recorded as the patient's DL at the frequency under test. This procedure is then repeated at a level 40 db. above the patient's threshold. The difference between the two DL's (DL at 10 db. minus DL at 40 db.) is recorded as the "DL difference" for the frequency under test.

METHOD OF RECORDING RESULTS

Standardization of the new method, called the "DL difference test," has been achieved by measuring the DL at 10 and at 40 db. for the frequencies 250 to 4000 cps on 24 normal ears. It was found that the DL at 10 db. was considerably larger

7. Jerger, J. F.: A Difference Limen Recruitment Test and Its Diagnostic Significance, Laryngoscope **62**:1316-1332, 1952.

than the DL at 40 db. on these normal ears. This finding is consistent with expectations based on previous investigations of the DL in the normal ear.[8] Table 1 shows the average difference (DL at 10 db. minus DL at 40 db.) at each frequency, as well as the standard deviation of the differences.

The data shown in Table 1 have been utilized in the construction of a chart (Chart 1), from which a patient's performance may be immediately compared with the DL difference typical of normal ears. The chart plots frequency along the horizontal dimension and the magnitude of the difference between the DL at 10 and that a 40 db. on the vertical scale. For example, if at 1000 cps a patient shows a DL of 2.5 at the 10 db. level and of 1.5 at the 40 db. level, his DL difference is recorded as 1.0 on the vertical line representing 1000 cps.

The heavy line running horizontally across the chart at about 0.9 db. is the average DL difference for the 24 normal ears. The shaded area on either side of

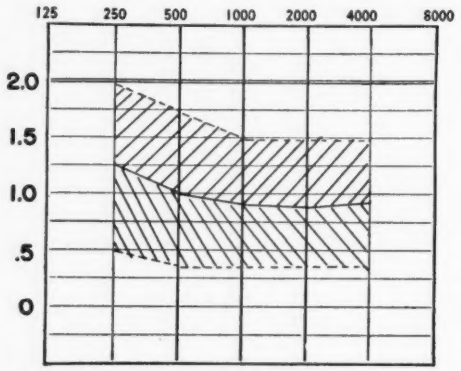

Chart 1.—DL difference record for recording of clinical results; shaded area covers range of variability of the DL difference in the normal ear.

this line encompasses an area of four standard deviations, two on either side of the average. For those not accustomed to the language of statistics a brief explanation is in order. The standard deviation is a statistical term used to describe the variability of a set of scores. In the present case it describes the variability of the 24 individual normal DL's around their average. In order to state that a certain DL difference is really smaller than normal, and hence clinically significant, it is necessary to demonstrate that it is not just a deviation from the average that falls within the range typical of normal responses. In the present case the shaded area on Chart 1 defines the limits within which 95% of normal responses would be expected to fall. In other words, if a patient's DL difference falls below the shaded area, there are only 5 chances in 100 that it is really normal and not abnormally small.

If a patient's DL difference falls within the shaded area, it is interpreted as normal, indicating the absence of recruitment. If the DL difference falls below the

8. Riesz, R. R.: Differential Intensity Sensitivity of the Ear for Pure Tones, Physiol. Rev. **31**:867-875, 1928.

shaded area, recruitment is assumed to be present. In other words, recruitment manifests itself as a narrowing of the difference between the two DL's. This is due to the fact that recruitment is most pronounced at or just above threshold,[9] thus resulting in a relatively greater degree of reduction in the size of the DL at 10 db. than at 40 db.

It should be pointed out, however, that, because this particular test requires a measurement 40 db. above the patient's threshold, it can be used only when the audiometer can produce a tone 40 db. greater than the patient's threshold. Thus, when the upper limit of the audiometer is 100 db., the test cannot be used if the threshold loss exceeds 60 db. To overcome this limitation I have added an amplifier to the standard clinical audiometer that produces intensities up to 130 db. above normal threshold for the frequencies 500, 1000, 2000, and 4000 cps. In the absence of such an amplifier, the original Lüscher technique, as modified for the 15 db. level, can still yield information of clinical value.

FINDINGS

The technique described above has been in routine use in the hearing clinics of Northwestern University for approximately nine months. Findings obtained with the method suggest two specific conclusions. First, the new technique tends to differentiate more clearly between recruitment and nonrecruitment than the original DL Test. Second, and more important, the new technique appears to make possible the quantification of recruitment. That is, it permits the clinician to measure not only the presence or absence of recruitment but how much recruitment is present at each frequency.

Superiority of Differentiation.—In order to test the superiority of the new method in differentiating between recruitment and nonrecruitment, both the original DL test and the new DL difference test were administered to 18 clinical patients. In each the original DL test showed recruitment, defined as a DL falling more than two standard deviations below the normal DL, at one or more frequencies. Thus the question of whether or not recruitment was present was not at issue. The objective was to determine whether the new technique would yield a DL difference which deviated from its norm at a greater level of statistical confidence than the old DL test.

Since each of the 18 patients was tested at from one to five frequencies, a total of 43 comparisons between the two tests was available. For each individual comparison, both the DL and the DL difference was transformed into Z scores.[10] Then the Z score of the DL was subtracted from the Z score of the DL difference. Thus a positive difference between the two Z scores would indicate that the DL difference was more effective in differentiating recruitment from nonrecruitment. On the other hand, a negative difference would indicate that the DL Z score was the more effective differentiator. The average Z score difference was plus 1.012, with a standard deviation of 0.91 ($t = 7.23$). If there were no real difference

9. Békésy, G.: A New Audiometer, Acta oto-laryng. **35**:411-422, 1947. Fowler, E. P.: The Recruitment of Loudness Phenomenon, Laryngoscope **60**:680-695, 1950.

10. The Z score is the ratio of the deviation of the obtained score from the average to the standard deviation of the average.

between the two tests, the theoretical average Z score difference would be zero. The extremely high t ratio indicates that the observed average Z score difference of 1.012 reflects a significant difference between the two tests. These data clearly indicate that the DL difference [11] test more effectively differentiates recruitment from nonrecruitment than the DL "test."

This decided superiority of the DL difference test as an indicator of recruitment has been dramatically illustrated in clinical experience. Chart 2*A* shows the audiogram of a 67-year-old man (Case 1) with a unilateral perceptive loss of unknown etiology. Administration of Fowler's alternate binaural loudness balance test

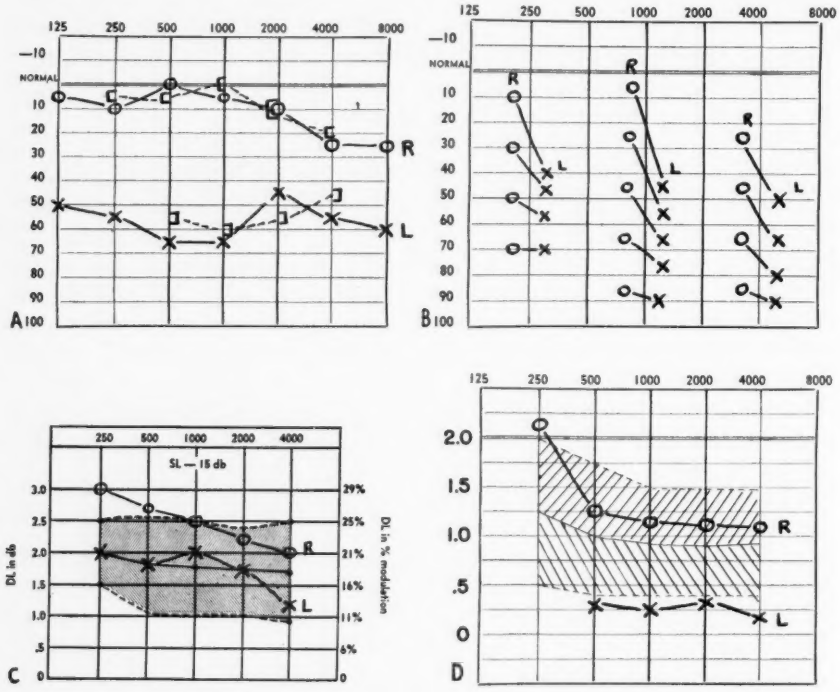

Chart 2.—*A*, audiogram of a 67-year-old man with a unilateral perceptive loss of unknown etiology. *B*, result of Fowler's alternate binaural loudness test, showing marked recruitment in the left ear. *C*, result of ordinary DL test; the DL's on the left ear are smaller than those on the right, but they fall within the range of variability of the normal DL. *D*, result of DL difference test; the DL differences on the left ear are not only smaller than those on the right ear, but they are also below the range of variability of the normal DL difference.

revealed marked recruitment in the left ear (Chart 2*B*). Chart 2*C* shows the result obtained with the ordinary DL test. It is apparent that the DL's on the left ear are clearly reduced relatively to the DL's on the normal-hearing right ear. But relatively to the normal average DL (heavy line running horizontally at about 1.8 db.), they are not reduced at all. If there were no normal right ear to serve as a guide,

11. When measured according to the techniques described above and by Jerger.[7]

the results of the DL test on the left ear would be completely misleading. Figure 2*D* shows the result obtained by the DL difference test. The DL differences for the left ear are not only reduced in comparison with the DL differences for the right ear, but they are also reduced relatively to the average DL difference (i. e., they fall below the shaded area).

This case illustrates the fundamental disadvantage of the DL test as a tool for clinical measurement. When statistically normal DL's are obtained in a patient with bilateral hearing loss, the clinician cannot be sure that they are not the abnormally small DL's of a patient whose DL's in the absence of hearing loss would lie at the

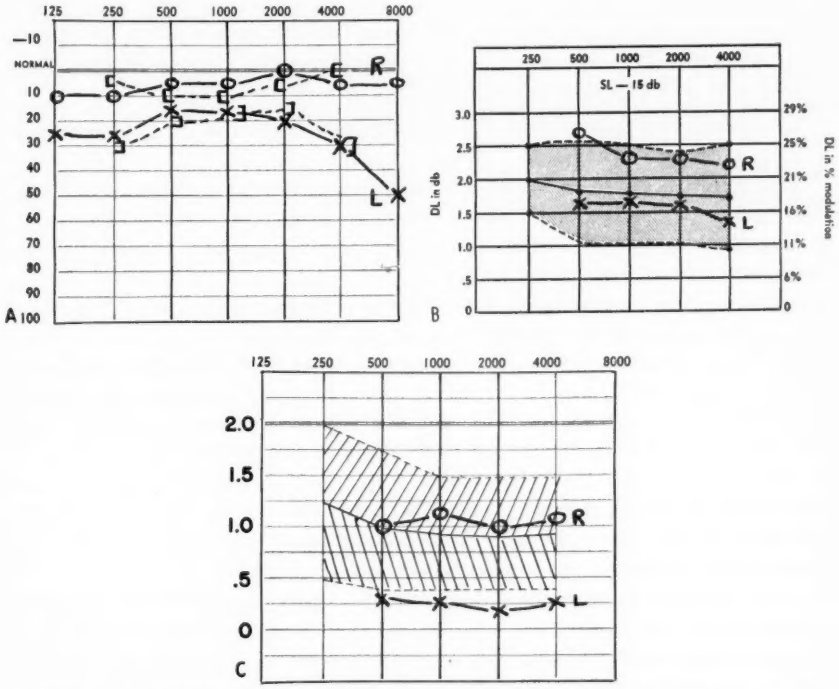

Chart 3.—*A*, audiogram of a 32-year-old woman with mild unilateral endolymphatic hydrops. *B*, result of ordinary DL test; the DL's on the left ear are smaller than those on the right, but they fall within the range of variability of the normal DL. *C*, result of DL difference test; the DL differences on the left ear are not only smaller than those on the right, but they are also below the range of variability of the normal DL difference.

upper end of the distribution of normal DL's. This was evidently the case in the patient described above. It affected his DL's but not his DL differences.

Chart 3 illustrates another advantage of the DL difference test, its superior sensitivity as an indicator of recruitment. Chart 3*A* shows the audiogram of a 32-year-old woman (Case 2) with a mild unilateral endolymphatic hydrops. Chart 3*B* shows the ordinary DL test result. Again the DL's on the impaired ear are reduced relatively to those on the normal right ear, but since they lie within the two standard deviation areas of normal DL's they would be interpreted as normal

in the absence of comparison with the normal right ear, i. e., if the patient's hearing loss had been bilaterally symmetrical. In Chart 3*C* it is evident that the DL differences statistically are abnormally small (fall below the shaded area). Thus the DL difference test demonstrated the presence of recruitment statistically when the threshold loss was only 15 db.

The superior sensitivity of the DL difference test illustrated by these two cases is of practical importance clinically in those cases in which bilateral symmetry of the hearing loss precludes comparison of the impaired ear with a companion normal ear, because it is in these cases that the variability of the DL tends to obscure significant deviations from the norm.

Quantification of Recruitment.—A survey of the recent experimental investigations of the loudness recruitment phenomenon reveals three general conclusions.

1. Recruitment is not present in all perceptive hearing loss. The evidence suggests that it is present only in perceptive loss of cochlear origin.

2. Recruitment is accompanied by a reduction in the size of the difference limen (DL) for intensity change.

3. Recruitment is accompanied by a reduction in the magnitude of the difference between DL's at levels close to and considerably above threshold. In other words, in the recruiting ear DL's close to threshold are reduced to a relatively greater degree than DL's farther above threshold.

In view of these interesting relationships, it is of some interest to ask the question, Is the degree of recruitment at an impaired frequency systematically related to the degree of cochlear hearing loss at that frequency? In other words, in hearing loss of cochlear origin, does the degree of recruitment increase as the cochlear loss increases? Or, the question can be rephrased: In hearing loss of cochlear origin does the DL decrease systematically as the cochlear loss increases?

Since the previous section has demonstrated that the DL difference is a more sensitive measure of recruitment than the DL, the question becomes, In hearing loss of cochlear origin, does the DL difference decrease systematically as the bone threshold decreases (i. e., cochlear loss increases)?

The answer to the last question was obtained by analyzing the DL difference records of all the patients with perceptive losses who have been tested in the Northwestern Hearing Clinics. These DL difference records fell into two categories: (1) those in which the reduction in bone acuity was accompanied by some reduction in the DL difference and (2) those in which the reduction in bone acuity was accompanied by no reduction in the DL difference.

Accepting the hypothesis of Dix, Hallpike, and Hood,[2] it was assumed that the perceptive losses in the former group were of cochlear origin, while those in the latter group were of retrolabyrinthine or noncochlear origin. Since the cases in the latter group could not contribute information pertinent to the problem under investigation, they were excluded from further consideration.

In all the cases comprising the former group (hearing loss assumed to be of cochlear origin) the conditions had been diagnosed as perceptive losses of varied etiology. Analysis of the DL differences obtained at varying levels of cochlear loss as reflected by bone conduction audiometry revealed a significant and systematic trend. Table 2 shows the average DL difference associated with varying levels of

bone conduction acuity for the frequencies 500 to 4000 cps (on the normal ear the DL difference is essentially constant over this frequency range), and the number of observations on which each average is based.[12]

The systematic trend exhibited in these data suggests that the quantification of recruitment in terms of the magnitude of the DL difference may be used to predict bone conduction acuity without recourse to bone audiometry in those cases in which the perceptive loss is due to cochlear lesion. In other words, if a bone threshold of 20 db. corresponds to an average DL difference of 0.30 db. in hearing loss of cochlear origin, then by measuring the DL difference of a particular patient and finding it to be 0.30 db., it would be reasonable to predict that the bone threshold lay at 20 db. if the hearing loss was purely of cochlear rather than retrocochlear origin.

This finding is of immediate practical utility in estimating the degree of cochlear loss in cases of otosclerosis—an important consideration in prognosis for fenestration surgery.

Although the mechanism of the perceptive loss (the so-called "secondary nerve degeneration") of otosclerosis is not known, the bulk of available evidence seems

TABLE 2.—*Average DL Difference for Varying Levels of Bone Conduction Loss in Cases of Pure Perceptive Loss and Number of Observations on Which Each Average is Based*

	Bone Conduction Threshold							
	0	5	10	15	20	25	30	35 or Greater
No. of cases	75	15	14	..	9	12	15	47
Ave. DL diff.	0.95	0.75	0.55	0.42*	0.30	0.18	0.10	0.02

* Interpolated.

to favor a cochlear rather than retrocochlear interpretation. Shambaugh[13] has noted that his observations support Siebenmann's[14] hypothesis that when the focus reaches the endosteum of the cochlea, metabolites from the pathologic bone, diffusing through the endosteum, might injure the cochlear receptor mechanism.

Evidence more pertinent to the present study has been presented by various European investigators. Zangemeister,[15] using a modified speech amplifying test, has observed the presence of recruitment in otosclerosis with perceptive involvement. Miskolczy-Fodor and Hajts,[16] using the Békésy principle of defining the

12. It should be emphasized that these numbers are valid only for the particular equipment and test procedure in use at the Northwestern University Hearing Clinics.

13. Shambaugh, G. E., Jr.: Long Term Hearing Results in Fenestration Surgery, Acta otolaryng. **40**:180-191, 1951.

14. Siebenmann: Totaler knöcherner Verschluss beider Labyrinthfenster und Labyrinthitis serosa infolge progressiver Spongiosierung, Verhandl. deutsch. otol. Gesellsch. **20**:267-274, 1911; cited by Shambaugh, G. E., ibid. **20**:191, 1911.

15. Zangemeister, H. E.: Über den Lautstärkeausgleich (Recruitment): Seine vereinfachte Messung und funktionsdiagnostiche Bewertung, insbesondere bei der Indikation zur Fenstrungsoperation, Acta oto-laryng. **38**:484-497, 1950.

16. Miskolczy-Fodor, F., and Hajts, G.: Behavior of the Difference Limen in Otosclerosis, Magyar Sebészet **3**:84-90, 1950; abstracted, Excerpta Med. XI **4**:1832, 1951.

DL at threshold, have made the same observations on 100 otosclerotics. Holmgren [17] reports similar conclusions using the Békésy audiometer.

Thus, without entering the controversy on the mechanism of the perceptive involvement in otosclerosis, it can be safely concluded that a reduction in the DL regularly accompanies otosclerotic perceptive involvement. This conclusion, together with the data presented in Table 2, suggests a method for estimating the degree of perceptive involvement independently of bone conduction audiometry.[18]

SUMMARY AND CONCLUSIONS

A new, simple, and practical method for the measurement of recruitment, utilizing the best features of both the Lüscher test and the Denes and Naunton technique, is presented. It is called the DL difference test because it defines recruitment in terms of the relationship between the magnitudes of the DL's at two suprathreshold sensation levels, 10 and 40 db.

Clinical experience with the DL difference test suggests the following conclusions:

1. The DL difference test is an easily administered test of recruitment applicable to bilateral as well as unilateral loss.

2. The DL difference test more effectively differentiates recruitment from nonrecruitment than the DL test.

3. The DL difference test permits the quantification of recruitment. In perceptive losses with recruitment, progressive reduction in bone acuity is accompanied by progressive reduction in the DL difference (DL at 10 db. minus DL at 40 db.).

4. Since reduced DL's have been consistently demonstrated in the perceptive component of otosclerosis, this finding promises to be of immediate practical utility in quantifying the magnitude of the perceptive component in the otosclerotic ear independently of bone conduction audiometry. Thus the DL difference test may prove of practical value in selecting patients for fenestration surgery.

Dr. Raymond Carhart and Dr. George E. Shambaugh Jr., Northwestern University, gave helpful suggestions and encouragement in this research.

17. Holmgren, G.: To the Development of Otosclerotic Surgery, Acta oto-laryng. **37**:26-29, 1949.

18. Jerger, J. F.: A New Test for Cochlear Reserve in the Selection of Patients for Fenestration Surgery, Ann. Otol. Rhin. & Laryng., to be published.

PERCEPTIVE DEAFNESS ASSOCIATED WITH PROPHYLACTIC USE OF TETANUS ANTITOXIN

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THE ETIOLOGICAL factors relative to the causation of perceptive deafness are many and varied. A listing of these factors would include the following: (*a*) toxins of the acute infectious diseases, and other toxins; (*b*) drugs, as salicylates, quinine, nicotine, alcohol, and streptomycin; (*c*) trauma, direct and indirect, as fractures or concussion; (*d*) occupational hazards, as noises and pressure changes; (*e*) specific diseases, as syphilis; (*f*) vascular disturbances of the brain and specialized centers or of local circulation to the cochlea and vestibule; (*g*) degenerative diseases of the nerve locally or of higher centers; (*h*) neoplastic changes. The lesions from these factors may be in the cochlea, the acoustic nerve, or the brain center. Yet the cause is, oftener than not, obscure and inferential, being arrived at by elimination or deduction long after the original symptoms appear, whereas the primary factors in the etiology usually remain untraced. This is a paradox that stems from the usually slow and gradual onset of hearing-loss symptoms and complaints of the patient, who finally realizes that there is an impairment in his hearing only after the lesion has involved a sufficient percentage of loss so that it interferes with his daily activities. However, with the appearance of a sudden and dramatic loss of hearing, dating from a particular and striking episode, the definitive factor in the causation of the hearing loss is more likely to be ascertained. With the latter situation in mind, we present an apparently rarely seen, rarely considered, and rarely reported cause of perceptive deafness—a prophylactic dose of tetanus antitoxin.

LITERATURE

Despite the fact that the administration of tetanus antitoxin is a commonplace procedure in civilian as well as military practice and that the development of serum sickness is not infrequent following the prophylactic or therapeutic use of the serum, one is not accustomed to thinking or reading of neurological complications following its use. Textbooks are legion that fail to present such sequelae as a possibility, though the existence of the complications has been recognized in the accessory literature since 1908.[1] Now available are many reports of the neurological aspects of serum disease following the use of sera given prophylactically or in the treatment

From the Ear, Nose, and Throat Department, the Jewish Hospital of Brooklyn.

1. Gangolphe, M., and Gardére, M.: Névrite au cours d'un cas de tétanos traité par le sérumthérapie, Lyon méd. **110**:497-499, 1908.

of already established disease complexes. Any and all parts of the nervous system may be involved.[2] There have been manifestations which have been subdivided [2d] into cerebral, meningeal, neural, radicular, spinal cord, spinal, and peripheral nerve types or combinations thereof. With the cerebral syndrome there have been presented choked disc,[2c] alexia, ocular palsy, hemianopsia, aphonia, and hemiplegia. The disorders of the meningeal group have been clinically manifested by increased spinal fluid pressure, cellular reactions, and meningeal reactions.[2d] Paralysis of the cranial nerves and bulbar syndromes are also listed.[3] Isolated musculospiral,[4] axillary, ulnar, median, radial,[5] popliteal, and sciatic nerve paralyses have been included.[6] Involvement of single muscles, such as the serratus anterior and the deltoid, has been noted.

Peripheral neuritis was first noted following serum therapy by Gangolphe and Gardère in 1908.[1] Richardson reported the first American case [2a] in 1917, multiple neuritis in a patient with treated tetanus. In reviewing the literature up to 1931, Hoagland [7] cites the report of Lhermitte [2b] with a summation of 77 cases of serum-produced neuritis, in most of which the ordinary prophylactic tetanus antitoxin injection had been given. Antipneumococcus and antimeningococcus sera had caused neurological complications in this reported series too. Wilson and Hadden [2f] in 1932 reported additional cases of neuritis following serum therapy. Through the years, a good many authors, among them Kennedy,[2d] Allen,[2e] Young,[2g] Doyle,[2h] Roger and Poursines,[2i] Bourgignon,[2j] and Pessin,[2k] have reported either a series of

2. (*a*) Richardson, W. M.: Tetanus with Secondary Multiple Neuritis, J. A. M. A. **68:** 1611-1612 (June 2) 1917. (*b*) Lhermitte, J.: Les paralysies amyotrophiques post-sérothérapiques, Paris méd. **52:**221-227 (March 8) 1924. (*c*) Brown, A. L.: Ocular Manifestations in Serum Sickness, Am. J. Ophth. **8:**614-618 (Aug.) 1925. (*d*) Kennedy, F.: Certain Nervous Complications Following the Use of Therapeutic and Prophylactic Sera, Am. J. M. Sc. **177:**555-559 (April) 1929. (*e*) Allen, I. M.: The Neurological Complications of Serum Therapy, Lancet **2:**1128-1131 (Nov. 21) 1931. (*f*) Wilson, G., and Hadden, S. B.: Neuritis and Multiple Neuritis Following Serum Therapy, J. A. M. A. **98:**123-125 (Jan. 9) 1932. (*g*) Young, F.: Peripheral Nerve Paralysis Following Use of Various Serums, ibid. **98:**1139-1143 (April 2) 1932. (*h*) Doyle, J. B.: Neurologic Complications of Serum Sickness, Am. J. M. Sc. **185:**484-492 (April) 1933. (*i*) Roger, H., and others: Les formes polynévritiques des paralysies sérothérapiques, Arch. méd. gen. et colonial **1:**65-78, 1932. (*j*) Bourgignon, G.: Les paralysis postsérothérapique, Paris, Jouve, & Cie, 1933. (*k*) Pessin, D.: Les paralysis postsérothérapique, Paris, Jouve & Cie, 1933. (*l*) Bedell, A. J.: Stereoscopic Fundus Photography, J. A. M. A. **105:**1502-1509 (Nov. 9) 1935. (*m*) Amberg, E., and Hewitt, R. S.: Tetanus, Tetanus Antitoxin, or Phenobarbital Deafness, ibid. **105:**585 (Aug. 24) 1935. (*n*) Moore, R. M., and Singleton, A. O.: Tetanus at the John Sealy Hospital, Surg., Gynec. & Obst. **69:**146-154 (Aug.) 1939. (*o*) Firor, W. M., and Jonas, A. F., Jr.: Researches on Tetanus: Production of Reflex Motor Tetanus by Intraspinal Injections of Tetanus Toxin, Bull. Johns Hopkins Hosp. **62:**91-109 (Feb.) 1938.

3. Coons, J. J., and Kirk, G. D.: Serum Disease with Special Reference to Polyneuritis, Ohio M. J. **35:**390-392 (April) 1939. Curtis, F. J.: Ocular Palsy After Anti-Typhoid-Tetanus Inoculation, J. Roy. Nav. M. Serv. **31:**180-181 (July) 1945. Bedell.[2l]

4. Brahdy, L.: Musculospinal Paralysis After Serum Injection (Recurring After Second Injection), Ann. Int. Med. **11:**1911-1912 (April) 1938.

5. Alajouanine, T.; Thurel, R., and Tricot, R.: Paralysie radiale post-sérothérapique (rôle pathogénique de l'urticaire), Rev. neurol. **77:**130-131 (May-June) 1945.

6. Footnote *2e, f, g.*

7. Hoagland, R. J.: Neuritis Following Serum Administration, Mil. Surgeon **82:**134-137 (Feb.) 1938.

cases or individual cases of neurological complications following the use of sera.[8] By 1939, Bennett [8l] had noted 115 cases of neurological complications.

In an analysis of 500 cases in which prophylactic tetanus antitoxin was given, Newell and McVea [9] found an incidence of 11.8% of serum sickness reactions, none of which had neurological complications. Thomas,[10] in a study of 2,000 cases of prophylactic tetanus antitoxin treatment, likewise reported no cases of neurological complications, and he was able to show a decreased incidence of serum reactions when epinephrine was incorporated in the injection dose of tetanus antitoxin. However, it is in the studies of serum reactions, rather than in those of the over-all field of prophylactic injection, that the neurological complication begins to make its appearance. Doyle [2h] indicated that the most frequent complication in his study of 49 cases of neurological reaction was involvement of the brachial plexus, followed in order of frequency by radial nerve neuritis and optic neuritis. His report did not include any cases of auditory or vestibular pathology.

As sidelight possibilities, it is interesting and yet awesome to note that the following conditions have been seen and reported subsequent to serum therapy: peritonitis,[11] amyotrophic paralysis,[12] rupture of aneurysm,[13] hypertension,[14] myocardial infarction,[15] cardiac failure,[16] and vocal cord paralysis.[8g]

In comparing reports on the use of the tetanus toxoid, plain or alum-precipitated, with that of the antitoxin it is found that reactions are markedly less with the toxoid. Berlin,[13] evaluating serum sickness, serum allergy, and anaphylactic shock

8. (*a*) Gage, M., and DeBakey, M.: Tetanus and Its Treatment, South. Surgeon **4**:246-259 (Aug.) 1935. (*b*) Vogel, P.: Über Polyneuritis nach Seruminjektion, Nervenarzt **8**:11-17, 1935. (*c*) Cutter, R. D.: Auditory Nerve Involvement After TAT: First Reported Case, J. A. M. A. **106**:1006-1007 (March 21) 1936. (*d*) Klopp, J. W.: Tetanus: Experience in Episcopal Hospital in Past 30 Years, 1905-1935, Ann. Surg. **104**:419-423 (Sept.) 1936. (*e*) Chavany, J. A., and Askenazy, H.: Réflexions à propos d'un cas de paralysie post-sérothérapique, Gaz. méd. France **43**:361-370 (April 15) 1936. (*f*) Schipkowensky, N.: Schädigungen des Nervensystems bei Serumkrankheit, Arch. Psychiat. **106**:779-792, 1937. (*g*) Neffson, A. H.: Recurrent Nerve Paralysis of Larynx After TAT, Arch. Otolaryng. **27**:201-203 (Feb.) 1938. (*h*) MacCready, P. B.: Inner Ear Deafness from Tetanus Antitoxin Injection, Ann. Otol. Rhin. & Laryng. **47**:247-252 (March) 1938. (*i*) Bennett, A. E.: Horse Serum Neuritis, with Report of 5 Cases, J. A. M. A. **112**:590-596 (Feb. 18) 1939. (*j*) Mignot, R.: Paralysie du plexus brachial après sérothérapique antidiphtérique, Presse méd. **44**:883-884 (May 30) 1936. (*k*) Moore and Singleton.[2n] (*l*) Firor and Jonas.[2o] (*m*) Coons and Kirk.[8] (*n*) Brahdy.[4]

9. Newell, C. E., and McVea, C.: The Prophylactic Use of TAT, South. M. J. **33**:962-967 (Sept.) 1940.

10. Thomas, C.: Tetanus Antitoxin: Study of Local and General Reactions in 1884 Cases; Preliminary Report, Texas J. Med. **27**:26-27 (May) 1931.

11. Wilson, J. W.: Unusual Case of Sensitivity to T. A. B. T. Stimulating Acute Peritonitis, J. Canad. M. Serv. **3**:281-285 (March) 1946.

12. Robalinho Calvacanti, L.: Paralisia amiotrófica generalizada, secundária a soroterapia antitetánica, Arq. neuro-psiquiat. **3**:129-137 (June) 1945.

13. Berlin, R. B.: Ruptured Aneurysm Following Typhoid-Tetanus Booster Injection, U. S. Nav. M. Bull. **44**:391-394 (Feb.) 1945.

14. Robertson, H. F., and Varmus, F.: Report of a Case of Peripheral Neuritis with Hypertension Following Serum Therapy, Mil. Surgeon **95**:129-132 (Aug.) 1944.

15. Mathieu, L.; Hadot, S., and Hadot, E.: Infarctus du myocarde et angor consécutifs à des accidents sérothérapiques, Arch. mal cœur **40**:328-332 (July-Aug.) 1947.

16. McKinlay, C. A.: Allergic Carditis, Pericarditis and Pleurisy: Report of Case of Serum Sickness with Predominant Cardiac Manifestations and Symptomatic Recovery (Preliminary Report), Journal-Lancet **68**:61-65 (Feb.) 1948.

after tetanus toxoid injection, noted rapid onset of these conditions within two hours but no serious complications. Whittingham [17] in a study of 61,104 immunizations with tetanus toxoid lists reactions in 0.02%, with no recorded cases of neurological complications. He felt that such reactions as developed were due to proteoses and peptones in the immunizing material. The United States Army report by Long and Sartwell [18] on the use of tetanus toxoid in World War II showed no cases of neurological damage. In essence, they listed two types of reaction: (1) the nonspecific with malaise, fever, and soreness; (2) the specific with itching, urticaria, and flushing. In the latter type onset of symptoms was within 30 minutes, whereas the nonspecific reaction was noted only after several hours. In their vast series they did note one case of transitory edema of the glottis. Following the elimination of peptones from the toxoid, the incidence of reaction was reduced from 63: 100,000 to only 2: 100,000. Lederer [19] in the *United States Naval Medical Bulletin* reported no cases of deafness, among patients under study at the Hearing and Speech Rehabilitation Study Center, that might have developed from serum reaction. Howard,[20] in the analysis of 1,000 cases of deafness with loss of at least 30 db. reported in the *United States Naval Medical Bulletin*, likewise presented none associated with serum reactions, and it is interesting that of the 1,000 cases of deafness only 12 were ascribed to quinine and 2 to salicylate medication damage.

ETIOLOGY

In the aforementioned literature there has developed the assumption that an allergic or anaphylactic response on the part of the body to the foreign serum underlies the development of the complicating neurological disorders. It also seems that the occurrence of the pathology is not due to the specific antitoxins of the serum injected, as any of the sera that have been in use or are now in use for the prevention or treatment of the diseases created by the organism of diphtheria, Pneumococcus, Meningococcus, Streptococcus, or tetanus may present identical neurological or other serum-sickness complications. The fact, however, is that the greatest common offender is tetanus antitoxin. It was noted by Bennett [81] that of the neurological complications associated with serum injection that have been seen more than 50% have followed the use of tetanus antitoxin prophylactically. He also indicated that the young male adult, who receives the greatest proportion of such injections, being exposed to trauma in play and work, is the most likely victim. The percentage relationship of neurological reaction to injection is still not precisely available. Bennett feels that serum sickness is in no way dependent upon atopic, hereditary sensitivities or anaphylaxis. It is his impression that serum sickness would occur in everyone if enough serum were given. This belief is at variance with many other studies. Newell and McVea,[9] for instance, show statistically that in 30% of patients who had previous therapeutic serum injections, in 20% of those

17. Whittingham, H. E.: Anaphylaxis Following Administration of Tetanus Toxoid, Brit. M. J. **1**:292-293 (Feb. 24) 1940.

18. Long, A. P., and Sartwell, P. E.: Tetanus in United States Army in World War II, Bull. U. S. Army M. Dept. **7**:371-385 (April) 1947.

19. Lederer, F. L.: Hearing and Speech Rehabilitation: Hearing Loss in the Navy and Marine Corps; Incidence, Etiology, and Statistical Analysis, U. S. Nav. M. Bull. Supp., pp. 194-201, March, 1946.

20. Howard, J. C.: Deafness and Drugs, U. S. Nav. M. Bull. **46**:387-391 (March) 1946.

with an asthmatic history, in 18% of those who have had previous prophylactic serum injections, and in 44% of those who have had previous serum reactions serum sickness developed after additional injections of prophylactic sera, in contrast with an over-all incidence of serum reactions of one in nine.

PATHOLOGY

The pathology associated with the neurological complication after the injection of serum is not fully clear. The simplest statement that can be made is that just as edema of the skin occurs in urticaria so edema of the nerve occurs with consequent neuritis as a form of serum sickness.[21] In other words, the neuropathologic changes appear to be similar to changes elsewhere in the body in the presence of an allergy. Kraus and Chaney [22] indicated it as a "primary disorder of the blood vessels causing nutritive impairment of the tissues of the nervous system, and interfering temporarily as a rule with the activity of the nerve fibers and cells, but occasionally causing cell death and parenchymal necrosis." They also concluded that an "edematous process may occur in the perineural sheaths, or that the nutrition of the roots or nerves may be interfered with by impairment in the blood supply thus causing various radicular and neural symptoms."

Stevenson and Alvord [23] found demyelination of the nervous system and periarteritis nodosa in their studies of peripheral neuritis, myelitis, and other disseminated pathology of the nervous system, produced by injections of sera or vaccinations against bacterial or viral diseases. Basing their thought on Wittmack's experimental work on round window irritation, Fuchs and Almour [24] hypothesize that in allergy deafness there is an increased fluid pressure of the perilymphatic space, with transmission of this compression to the endolymphatic spaces, which in turn exert pressure on the end-organs of the cochlear and vestibular nerves. Another supposition in this regard is the primary increase of pressure in the endolymphatic space, as described in Williams, Horton, and Day.[25] It may be said that knowledge of the subject of deafness caused by allergy, serum sickness, and anaphylaxis is not complete enough to permit a statement of the entire true picture of the pathology.

CASES

Of the four previously reported cases of auditory nerve involvement after the use of tetanus antitoxin, two were in patients with clinical tetanus. These two had received large doses of the serum intraspinally, intravenously, and intramuscularly for therapeutic effect. The other reported cases of deafness occurred after the prophylactic use of the tetanus antitoxin and were preceded by serum sickness either by a few hours or by days.

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21. Rackémann, F. M.: Medical Progress: Allergy; Serum Reactions, with Particular Reference to Prevention and Treatment of Tetanus, New England J. Med. **226**:726-733 (April 30) 1942. Brahdy.[4] Hoagland.[7] Bennett.[81]

22. Kraus, W., and Chaney, L. B.: Serum Disease of the Nervous System, Arch. Neurol. & Psychiat. **37**:1035-1047 (May) 1937.

23. Stevenson, L. D., and Alvord, E. C., Jr.: Allergy in the Nervous System, Am. J. Med. **3**:614-620 (Nov.) 1947.

24. Fuchs, A. M., and Almour, R.: Allergic Deafness, New York J. Med. **47**:1397-1398 (June 15) 1947.

25. Williams, H. L.; Horton, B. T., and Day, L. A.: Endolymphatic Hydrops Without Vertigo, Tr. Am. Otol. Soc. **35**:116-140, 1947.

In 1935, Amberg and Hewitt [2m] reported the first case of inner ear deafness associated with the therapeutic use of tetanus antitoxin. The serum, given by three modalities, was used in a case of clinical tetanus in a boy of 17. Deafness, that developed in six days with serum sickness after completion of the therapy, was total and did not regress. Cutter,[8c] in 1936, reported a similar case of deafness in a boy of 14 years, who had clinical tetanus. One week after intensive serum therapy by vein, by spinal injection, and by muscle injection there developed deafness, tinnitus, diplopia, and giant urticaria. At first there was a 40% loss of hearing on the right and a 50% loss on the left, which loss progressed to 61% and 69% respectively in a week. Later, however, there was an improvement in hearing with the loss established at 9% and 21% in the right and left ears. How much of the deafness in these two cases might be attributed to the disease entity itself and how much to the antitoxin reaction cannot be established. Spaeth [26] in a review of cases of tetanus does not list any with auditory nerve damage as sequelae, whereas Tribby and Long [27] report a cranial nerve paralysis.

Deafness following the use of a prophylactic dose of tetanus antitoxin was first reported by MacCready [8h] in 1937. The dose of 3,000 units of tetanus antitoxin was given intramuscularly in the right arm of a boy of 15 years, following a minor laceration. Nine days later there developed a severe serum reaction manifested by swelling at the site of the injection, vertigo, elevation of temperature, and malaise. With the vertigo there was a marked falling reaction. Five days after this serum sickness, the boy awakened with a severe degree of bilateral deafness. Audiometric study showed a 46% loss on the right, and a 45% loss on the left. The caloric tests were nonresponsive, though a weak response to the turning tests did exist. There was no improvement shown in subsequent studies. The history was devoid of personal or familial allergic tendencies, but it is to be noted that the child had received diphtheria antitoxin preventively 10 years before without reaction at that time.

Taylor [28] surveyed the literature and excellently summarized the available material when reporting the second case of deafness after the prophylactic use of tetanus antitoxin, in 1942. His patient, a white man of 51 years, received 5,000 units of tetanus antitoxin prophylactically for a laceration. In five days serum sickness developed, and within six hours after this onset a severe tinnitus and deafness ensued and persisted. The patient was first seen by the otologist five months later. A perceptive deafness with a 68% loss in the right ear and a 70% loss in the left ear was found by audiography. The cold caloric test elicited no response, but a horizontal nystagmus of short duration was obtained with the turning tests. In the follow-up the findings indicating permanent deafness with vestibular impairment were corroborated.

The case now presented, the third recorded in the literature of deafness after the prophylactic use of tetanus antitoxin, is that of a white woman of 23 years. She suffered a laceration of the right knee when thrown from a horse, and was given on the day of the injury a prophylactic dose of 3,000 units of tetanus antitoxin.

26. Spaeth, R.: A Clinical Study of Tetanus, Am. J. Dis. Child. **60**:130-169 (July) 1940.

27. Tribby, W. W., and Long, C. H.: Cephalic Tetanus Accompanied by Paralysis of Facial Nerve and Generalized Tetanus, J. A. M. A. **117**:678-680 (Aug. 30) 1941.

28. Taylor, H. M.: Neurological Complications of Serum Sickness with Special Reference to the Ear, Laryngoscope **52**:923-932 (Dec.) 1942; Tr. Am. Otol. Soc. **32**:185-200, 1942.

There was no head injury, concussion, or unconsciousness. One week after the injection generalized giant urticaria developed which necessitated the use of subcutaneous epinephrine for relief. The day after the onset of the urticaria she was struck with sudden deafness and persistent tinnitus. There was no vertigo at any time. With the hearing loss remaining unabated, she was referred for consultation about three months after the onset of the deafness. The rest of the history, past, personal, and familial, was noncontributory.

In the examination of the patient, the ear, nose, and throat structures were basically normal from the anatomical study. Laboratory studies likewise showed no abnormality. The auditory investigation was as follows:

Whispered Voice	not heard at either ear
Conversational Voice	heard at the ears
Weber Test	not lateralized
Rinne Test	both infinitely positive
Schwabach Test	both —4 (normal being plus/minus)
Individual Forks	C64 to C1024 heard poorly in both ears, with the left slightly better than the right. C2048 and above not heard at all.
Audiogram	Right ear showed a 69% loss of hearing; left ear showed a 62% loss. There was a complete loss of hearing in both ears at 2000 cps and above.
Vestibular Study	There was no spontaneous nystagmus, past pointing, or vertigo. Cold caloric testing induced normal responses in both ears, and in both the horizontal and vertical canals. Turning tests and galvanic tests were not done in view of the normal caloric responses.

The Eustachean tubes were patent, and there was no improvement with inflation. The diagnosis was made of bilateral deafness, perceptive type with normal labyrinth, caused by serum reaction following the use of a prophylactic dose of tetanus antitoxin. Follow-up studies failed to reveal any improvement in the hearing.

COMMENT

The appearance of neurological complications following the use of serum injections cannot be foretold, though it should be thought of and considered when serum sickness develops. The site of injection has no bearing on or predilection for the site of neurological complication, if any appears. How the damage occurs, and its selectivity for individuals is still in the realm of hypothesis, though in all probability it is part of the serum sickness pathology. Some of the peripheral nerve paralyses have shown a tendency toward recovery, but in the main the damage to the nerve is permanent. Of the five patients in whom the auditory nerve was affected, only one has shown some recovery and only one has failed to show vestibular involvement.

Therapy has not been presented or discussed, for all such attempts in treatment were ineffectual. Usually attempts toward dehydration and reduction of edema [81] by the use of hypertonic solutions plus the use of epinephrine and ephedrine for the symptomatic relief of the serum sickness were employed, but these measures did not help the neurological phase. Physical therapy for the peripheral neuritides was of some benefit over long periods of use. The use of epinephrine at the time of serum injection as practised by Thomas [10] did lessen the frequency of the serum

reaction. With widespread use of the toxoid in present day immunization and stimulating "booster" dosage, there should be a marked decrease even in the incidence of serum disease from that common offender "minor laceration." Yet the possible increasing frequency of penicillin sensitivity reactions simulating serum reactions may force preparation, at least by thought, for neurological complications. The antihistamines, given orally or intravenously, would be of help in the presence of serum sickness. Cortisone, though causing edema and sodium retention, has proved beneficial and life-saving in severe allergic manifestations and should be thought of in the acute phase of severe serum sickness.

Thus, reverting back to the specific interest of eighth nerve damage after tetanus antitoxin, what could have been done, and what could be done when so acute, dramatic, and tragic a picture is presented? Certainly any patient with serum sickness showing a tendency toward tinnitus, vertigo, or impairment of hearing requires immediate therapy to counteract the impending nerve damage. In this emergency the armamentarium should include epinephrine, the antihistamines (administered orally and/or intravenously), cortisone, and possibly intravenous histamine (as suggested by Hallberg and Horton [29]). But it is to be remembered that these suggested measures must be used as the symptoms are presenting and not after the pathological changes have occurred.

SUMMARY

The third case of perceptive deafness following the prophylactic use of tetanus antitoxin is reported.

Neurological complications after the use of sera for prophylaxis or therapy are uncommon, but not rare.

The neurological complications of serum disease probably are closely allied to and related to the pathology of other manifestations of serum disease. The exact mechanism of auditory nerve damage associated with serum disease is still not clearly known.

The onset of neurological symptoms associated with serum disease requires immediate therapy to prevent permanent damage.

29. Hallberg, O. E., and Horton, B. T.: Histamine and Deafness, Proc. Central Soc. Clin. Res. **18**:44-45, 1945; Sudden Nerve Deafness: Treatment by Intravenous Administration of Histamine, Proc. Staff Meet., Mayo Clin. **22**:145-149 (April 16) 1947.

Case Reports

HEMANGIOMA OF THE PAROTID GLAND

Report of Two Cases

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HEMANGIOMA within the capsule of the parotid gland and replacing the glandular tissue is apparently an uncommon finding.[1] Bernier and Tiecke [2] reported a small superficial hemangioma of the parotid gland in an adult in April, 1950. Bernier [3] stated that the files of the Registry of Dental and Oral Pathology listed only six such tumors over a period of 20 years.

The importance of such a tumor in this location presents a challenge not only in diagnosis, but also as to the best method of therapy. Certainly an enlarging parotid tumor in a young person or infant poses a problem as to therapy. Recently I have been interested particularly in the relationship of the facial nerve to the parotid gland and have employed a special technique in first isolating the nerve and then defining its course through the parotid gland.[4] A faradic nerve tester is employed throughout this procedure. Once the nerve is defined and isolated, the parotid gland is removed without hazard. In both cases reported below, it was quite important that the facial nerve be carefully freed from the parotid gland, inasmuch as the tumor had largely replaced all gland substance, thus necessitating a parotidectomy.

REPORT OF CASES

CASE 1.—L. S. R., an 8-month-old white infant, was first seen Dec. 26, 1951. A tumor of the left cheek had been slowly enlarging for four months. The child was otherwise in perfect health and had a good appetite. Examination revealed a well-developed and well-nourished infant who was normal except for the tumefaction over the left cheek. This mass had a doughy consistency. It was apparently limited to the confines of the parotid gland. There was no tenderness or evidence of inflammation. Stensen's duct on the left side was normal, and milking the duct gave normal saliva. The preoperative diagnosis was that of a lipoma or lymphoma. Hemangioma was not thought of. There were no hemangiomas on other parts of the body. Blood and urine studies were not significant.

On Jan. 3, 1952, under open drop ether anesthesia, an incision was made in front of the tragus of the left ear down to the angle of the jaw and then curved slightly forward under the mandible. Incision was carried down to the base of the styloid process, and the capsule of the parotid

From the Department of Otolaryngology, Baylor University College of Medicine.

Read before the Houston Opthalmological and Otolaryngological Society, Nov. 13, 1952.

1. Ahlbom, H. E.: Mucous- and Salivary-Gland Tumors: Clinical Study with Special Reference to Radiotherapy, Based on 254 Cases Treated at Radiumhemmet, Stockholm, Acta radiol., Supp. 23, pp. 37-47, 1935.

2. Bernier, J. L., and Tiecke, R. W.: Hemangioma of the Parotid Gland, J. Oral Surg. **8**:171-173, April, 1950.

3. Bernier, J. L., and Ash, J. E.: Atlas of Dental and Oral Pathology, Ed. 4, Washington, D. C., American Registry of Pathology, National Research Council, Army Institute of Pathology, 1948, p. 164.

4. Cody, C. C., III: Management of Parotid Lesions, Texas J. Med. **44**:374-378 (Sept.) 1948.

gland was pushed forward. The facial nerve was then identified, with use of the nerve tester. The nerve was found at the point where it swings forward from its stylomastoid foramen, just medial to the styloid process. It was then dissected from the gland and retracted to one side. The parotid gland was then removed piecemeal, the outer segment (that portion lateral to the facial nerve) being removed first. The deeper portion, including the inner prolongation (glenoid lobe), was then removed. A small portion of the gland, far anteriorly, that appeared grossly normal was left. The incision was then closed with a tiny Penrose drain, which was removed on the first postoperative day. The child had an uneventful postoperative course and has been followed to the present time. The incision is well healed, without evidence of any tumefaction or other abnormality. There was no weakness of the facial nerve postoperatively.

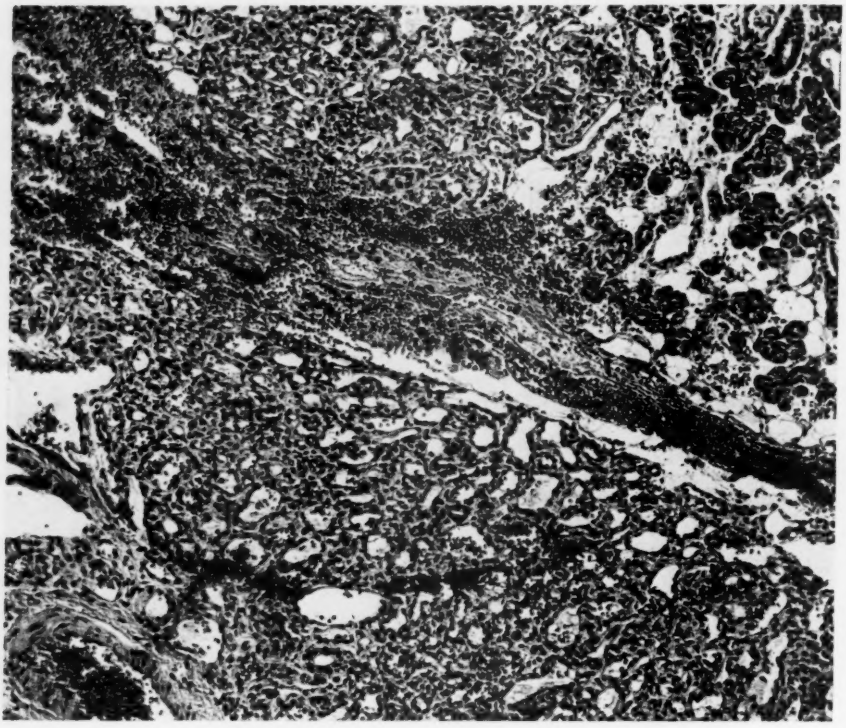

Fig. 1 (Case 1).—Cellular hemangioma.

Pathological Report.—Microscopic examination showed that Preparation A had two portions of the lateral margin, which was composed of salivary gland acini separated by lobules of adipose tissue. The central portion had similar tissue, with discernible ducts of gland. In one field there was merging of the normal-appearing salivary gland into tumor tissue composed of closely packed endothelial-lined spaces containing red blood cells. Attempts at duct formation were seen in some fields within the tumor; some were lined by a single layer of tall columnar cells, while others were poorly formed, composed of heaped-up elongated dark cells. There was no attempt to reproduce salivary acini. However, blood channels of varying sizes were numerous. The cells varied in size and shape, the majority being elongated, oval, and dark staining. There was a paucity of mitotic figures.

Preparations B and C were essentially similar; a delicate fibrous capsule could be made out in some portions. However, for the most part, nonencapsulated tumor tissue extended to the border of the removed preparations.

The reduplication and formation of the new blood spaces, the dense stroma in some fields, and the poor encapsulation were seen in a hemangioma involving the parotid gland.

The diagnosis was cellular hemangioma of the parotid gland.

CASE 2.—M. D., a child barely 2 months old, was first examined Aug. 22, 1952. A swelling had first been noticed in the right cheek when the child was about one week old. This swelling had since progressively enlarged. There was apparently no pain or discomfort associated with this tumor, and the child had a good appetite.

The patient was a well-developed and well-nourished Mexican female infant of the stated age. There was a pigmented nevus over the right cheek, and the right parotid gland was enlarged

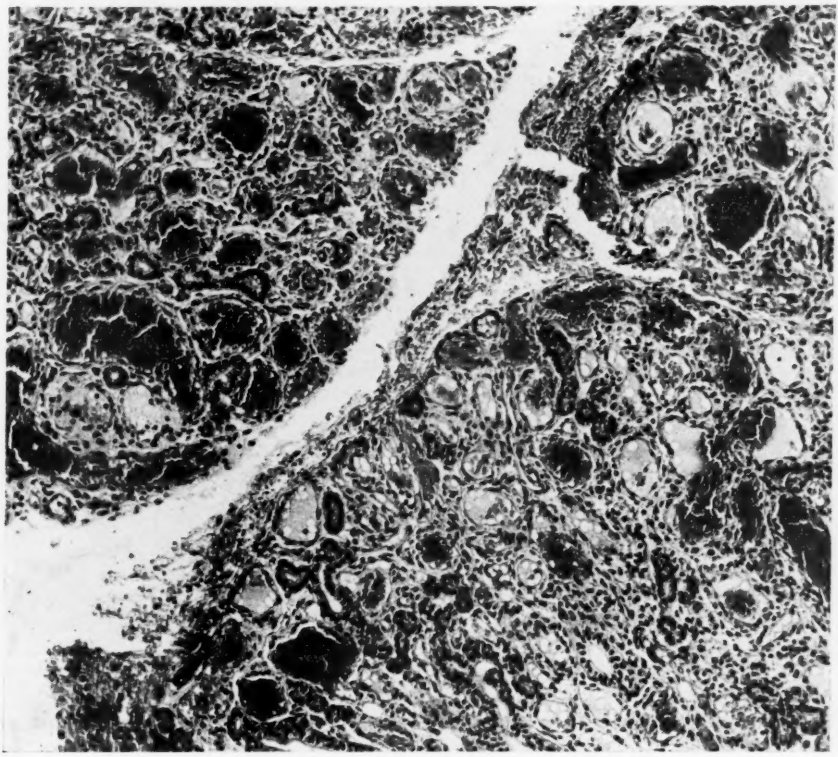

Fig. 2 (Case 2).—Capillary hemangioma.

to about twice its normal size. The mass had a soft doughy or rubbery feel, and was painless. The skin had a bluish cast where the tumor lay under the skin. Except for the pigmented nevus of the right cheek, there were no other birthmarks. The oral cavity appeared normal, as did Stensen's duct on the right. Very little saliva could be expressed from this duct. Blood and urine studies were noncontributory.

The child was followed at frequent intervals from Aug. 22 to Sept. 4, 1952. During this time there was a slow but resolute enlargement of the tumor mass in the right parotid gland. Accordingly, on Sept. 5, 1952, under open drop ether anesthesia, the tumor mass was explored. In fairness, it should be stated that on this occasion the first impression was that this probably was a hemangioma of the parotid gland. Incision in front of the tragus of the right ear down to the angle of the mandible and then forward below the ramus of the mandible was made. The capsule of the parotid gland was then separated from the perichondrium of the external auditory

meatus down to the base of the styloid process. Here again, with the aid of the faradic nerve tester, the 8th nerve was easily identified and then traced forward into the capsule of the parotid gland. The pes anserinus was identified and the finer branches of the facial nerve traced through the gland to the periphery of the gland. Most, if not all, of the parotid gland appeared to have been replaced with bluish friable tumor tissue which bled only slightly. After the facial nerve was identified, the outer segment of the parotid gland was removed, and then with carefully retraction of the facial nerve the deeper lobe was extracted. It should be noted that in this infant the facial nerve was most easily identified, and thus parotidectomy proved not too difficult. The incision was closed with a small drain, which was left in place for 24 hours. The wound healed, and the infant had an uneventful convalescence. There was no weakness of the facial nerve postoperatively.

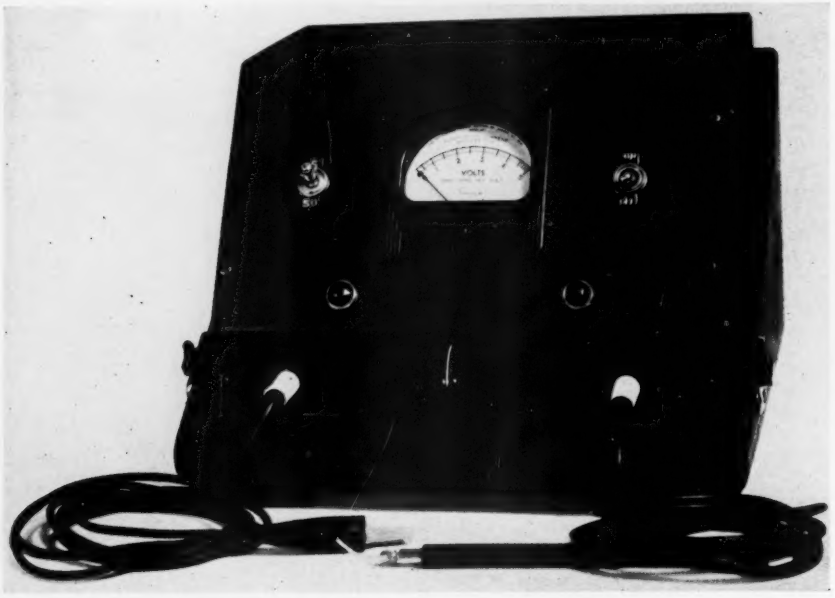

Fig. 3.—Type of nerve stimulator used. This is a small portable machine which can be plugged into any alternating current outlet. One end is attached to a plate on the patient's body. The other electrode is sterilized and has a sterling silver tip to facilitate more delicate application. Once the nerve is identified, the current is lowered to give just a response if the electrode is directly on the nerve. This reduces spread of the current and overstimulation of the nerve.

Pathological Report.—Microscopic examination showed that there were several sections of a lobulated, apparently encapsulated tumor composed of numerous closely packed small blood vessels. The endothelium was thickened and had hyperchromatic nuclei. Some areas were compact, with little or no blood space discernible. Scattered about the periphery but intermingled with capillaries were small islets of parotid acinar tissue and an occasional duct.

One section was a small lymph node, which was unremarkable except for recent hemorrhage. One section of skin was covered by hyperplastic, vacuolated epidermis in which there was moderate irregularity in nuclear size and density. No evidence of malignancy was seen in any of the sections.

The pathologic diagnosis was capillary hemangioma of the parotid gland and reactive hyperplasia of the skin, with no significant histologic change in the lymph node.

It was felt that there might have been some tiny fragments of parotid gland left in the wound, inasmuch as the tumor was quite friable and had to be removed piecemeal. Because the

tumor had shown such rapid growth, it was felt that x-ray therapy should be considered in this case. However, no immediate decision was made, and the child was followed at regular intervals. On Oct. 13, 1952, it was felt that a slight recurrence of the swelling of the right parotid region had taken place. Accordingly, on that day a total of 500 r in 100 r doses was given, using 200 kv. radiation filtered with 0.5 mm. Cu and 1 mm. Al. A 4 by 5.5 cm. field was used. It was thought that subsequent irradiation might be necessary should the situation warrant. However, within a week the slight swelling of the right parotid region regressed, and the child has shown no further tendency toward recurrence.

COMMENT

Hemangioma must be considered as one of the causes of parotid tumors, particularly in young people. One need not fear parotid gland surgery when the approach described, which gives ready access to the facial nerve for identification, is used. Some type of faradic nerve tester is of tremendous aid to the surgeon in doing any type of work in the region of the parotid gland (Fig. 3). It supplies confidence and assurance to the surgeon and safety to the patient. A nerve that is seen is one that is not injured.

In both cases discussed, the hemangiomas were more cellular than usual, containing much angiomatous proliferation, although in Case 2 there were some capillary spaces. Hence, the old classification of (1) cavernous and (2) capillary hemangiomas could well include a third classification, (3) "cellular hemangioma," in which there are few actual blood spaces but much endothelial proliferation.[5] Of course, the treatment depends on the particular case, but it is felt that when a hemangioma is deeply situated, especially in an organ which is resectable, surgery probably lends itself better to the situation. This procedure confirms the diagnosis, and later, if irradiation is felt necessary, a histological picture of the lesion will be available. Also, with the mass of tumor removed, a smaller dose of irradiation should be effective. Certainly, use of sclerosing solutions in the region of the parotid gland should be condemned.

SUMMARY

Two cases of hemangioma of the parotid gland are presented. It is felt that adequate surgery is the treatment of choice in such cases and that irradiation can be used later if the condition proves this necessary.

5. Kernan, J. D.: Surgery of the Nose and Throat, New York, Thos. Nelson & Sons, 1942, pp. 262, 404, 638. Laymon, C. W.: Diagnosis and Treatment of Hemangiomas, Journal-Lancet **70**:396-397 (Oct.) 1950. Lederer, F. L.: Diseases of the Ear, Nose and Throat, Ed. 3, Philadelphia, F. A. Davis Company, 1942, pp. 178, 520, 528, 822. Pack, G. T., and Miller, T. R.: Hemangiomas: Classification, Diagnosis and Treatment, Angiology **1**:405-426 (Oct.) 1950.

POSTINTUBATION LARYNGEAL GRANULOMA

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RECENTLY Lieberman [1] reported an instance of granuloma of the larynx following intubation for intratracheal anesthesia. He added a 23d case to the 22 previously reported. The purpose of this report is to add one additional case, subsequent to the insertion of a tube into the larynx. Undoubtedly, there are many unreported cases.

REPORT OF A CASE

A. W., aged 29 years, a white woman, was referred by her psychiatrist on Feb. 18, 1950. Her complaints were severe pain in the throat, severe hoarseness, momentary episodes of a sensation of suffocation. She felt something like a flap stopping all her vocal power. She had a constant desire to clear her throat. There was occasional pain on swallowing. These symptoms began five weeks after a thyroglossal cyst operation, performed Dec. 21, 1949.

Her history included a "virus X" infection during November, 1949. A thyroglossal cyst operation had been performed at the age of 8 years. Because of recurrence of the cyst, she was reoperated upon Dec. 21, 1949. The anesthesia employed was intravenous thiopental sodium (Pentothal), with an intratracheal tube inserted through the larynx.[2]

On Feb. 3, 1950, while visiting in St. Louis, because of the onset of the above symptoms she sought the opinion of an otolaryngologist, who informed her that she had contact ulcers of the larynx. The examination on Feb. 18, 1950, revealed the following: hoarseness; a well-healed transverse scar, across the midline of the neck, 7.5 cm. in length; no evidence of cyst. By mirror laryngoscopy two large pale pink-gray masses were observed, each attached to the mucosa of the corresponding arytenoid cartilage, and obscuring a view of the posterior commissure. The vocal cords and arytenoids were mobile, and the masses moved with the arytenoids.

Additionally, enlarged tender anterior and posterior cervical lymph nodes and axillary nodes were palpated. The red blood cell count was 3,400,000; hemoglobin, 80.0%; white blood cells, 7,200; polymorphonuclears, 46%; small lymphocytes, 44%; large monocytes, 6%; eosinophiles, 4%. The heterophile antibody reaction was reported as negative. The medical consultant determined that the liver and spleen were not enlarged.

By April 20, 1950, the tender adenopathy had subsided, and on that date, when the patient was hospitalized at the Manhattan Eye, Ear and Throat Hospital, the masses were removed by direct laryngoscopy. The bases of the arytenoidal wounds were touched with 12.5% silver nitrate solution. The postoperative course was smooth and the patient was discharged from the hospital the following day. By May 26, 1950, she was symptom free and the larynx presented a normal appearance. A reexamination, March 13, 1951, again revealed a normal-appearing larynx, and the patient was symptom free.

The masses were microscopically studied by A. A. Eggston, who reported: "The section shows granulation tissue and some hyaline necrosis. There is some infiltration with lymphocytes and plasma cells, plus fibrin. There are numerous thin-walled vessels and some edema. The diagnosis is granulation tissue."

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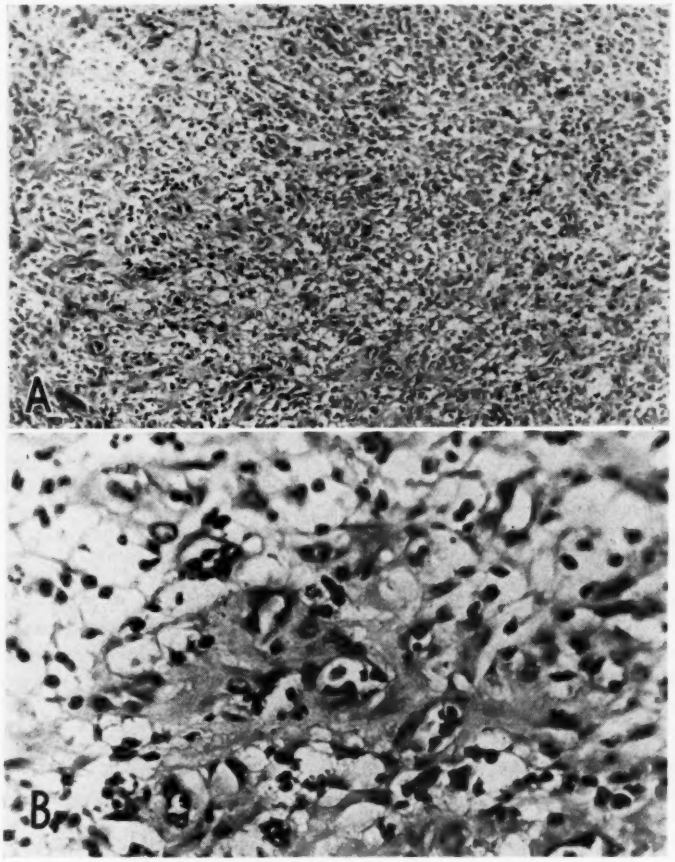
1. Lieberman, G. E.: Bilateral Granuloma of the Larynx Due to Intratracheal Anesthesia, A. M. A. Arch. Otolaryng. **56**:204 (Aug.) 1952.

2. Personal conversation with Hayes Martin, M.D.

COMMENT

Postbronchoscopic laryngeal granuloma apparently has not been observed. What, then, may be some of the reasons to account for injury to the larynx as the result of intubation for intratracheal anesthesia? Some possibilities present themselves: (1) the chemical composition of the intratracheal tube; (2) the chemicals used to sterilize these tubes; (3) the length of time during which the tube resides within



Photomicrographs of granuloma of larynx. *A*, × 75; *B*, × 340.

the larynx; (4) the spring-like action of the tube, which may exert even greater pressure than the standard rigid metal bronchoscope; (5) the size of the anesthetic tube; (6) the construction of the advancing tip of the tube; (7) the technique of introduction of the tube through the larynx.

One or more of these, or other factors, may contribute to the laryngeal trauma. In any event, the desirability of preventing the development of laryngeal granuloma as a complication of intubation is self-evident.

CORTICOTROPIN (ACTH) IN LETHAL GRANULOMA OF THE NOSE AND FACE

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NORMAN PARRY, M.D.
AND
DAVID MARKSON, M.D.
CHICAGO

TREATMENT with corticotropin in the case being presented gave such dramatic results that it has seemed worth while to make a brief report. For years malignant (lethal) granuloma of the nose has resulted in a fatal outcome, in spite of what was done for the patient. Fortunately, encouraging results have appeared recently. Williams and Hochfilzer,[1] in 1950, and Paul Moore and his associates,[2] in 1951, reported successful treatment of idiopathic granuloma of the face with cortisone.

In 1933 Patrick Dempsey,[3] of Dublin, reported on "Nasal Granulomata" and under the heading of "malignant granuloma" recorded seven cases found in the literature up to that time. He stated that it is a tumor of unknown etiology, due to no visible organism, made up of granulation tissue, and malignant in its behavior. Syphilis was usually thought to be the cause of the condition, but the Wassermann reaction was negative, and antisyphilitic and local treatment failed. In some cases x-ray treatment was carried out, but without improvement. Stewart,[4] as quoted by Moore and associates,[2] stated that the lesions first produce a stuffy sensation in the nose, with a watery discharge. In the next stage, ulceration and a foul discharge occur. The process extends and may spread to the outside of the nose. Finally the patient becomes exhausted, and the facial appearance becomes greatly distorted. The patient may die of hemorrhage from involvement of a large vessel, or otherwise of exhaustion. In some cases progressive destruction of the nose, face, and pharynx may be shown.

Moore quotes Teilum [5] as stating that there is support for the view that these lesions are primarily vascular and of an allergic nature. Klinge [6] is quoted as believing that nonspecific granuloma is an allergic lesion that is closely related to

1. Williams, H. L., and Hochfilzer, J. J.: Effect of Cortisone on Idiopathic Granuloma of the Midline Tissues of the Face, Ann. Otol. Rhin. & Laryng. **59**:518-530 (June) 1950.

2. Moore, P. M.; Beard, E. E.; Thoburn, T. W., and Williams, H. L.: Idiopathic (Lethal) Granuloma of the Midline Facial Tissues Treated with Cortisone: Report of a Case, Laryngoscope **61**:320-331 (April) 1951.

3. Dempsey, P.: Nasal Granulomata, Brit. M. J. **2**:194-196 (July) 1933.

4. Stewart, J. P.: Progressive Lethal Granulomatous Ulceration of the Nose, J. Laryng & Otol. **48**:657-701 (Oct.) 1933.

5. Teilum, G.: Pathogenetic Studies on Lupus Erythematosus Disseminatus and Related Diseases, Acta med. scandinav. **123**:126-142, 1946.

6. Klinge, F.: Der Rheumatismus: Pathologisch-anatomische und experimentell-pathologische Tatsachen und ihre Auswertung für das ärztliche Rheumaproblem, Ergebn. allg. Path. u. path. Anat. **27**:1-351, 1933.

rheumatic fever as well as to allergic vascular lesions such as periarteritis nodosa and lupus erythematosus disseminatus. Williams [1] stated that all the physiologic mechanisms of the body for resistance to stress lie in a stereotyped reaction of the peripheral vascular bed. This reaction may produce the clinical manifestations of allergy without the intervention of an antigen-antibody reaction. Moore reiterates that the midline of the face is a region where skin and subcutaneous tissues, and submucosal tissue come into close relationship. Hyperimmunity can be produced here, and it is logical to believe that these tissues might easily become the site of a destructive granulomatous reaction of an allergic nature. He makes a very pertinent statement as regards the pathology: "Pathologists are careful to report sections taken from these lethal granulomas as being not 'typical' or 'diagnostic' of this or that condition, being prepared to admit that an atypical example of any one of the specific granulomas might be present." Among the conditions which have to be differentiated are rhinoscleroma, tularemia, leprosy, blastomycosis, actinomycosis, glanders, oidiomycosis, malignant tumor, tuberculosis, syphilis, and sporotrichosis.

REPORT OF A CASE

The patient was a man, aged 60, who was first seen by two of us (E. W. H. and N. P.) in September, 1951. He stated that he had noted localized swelling at the left side of the nose for about five months. Of late, another more diffuse swelling had extended towards the inner angle and lower lid of the eye, resulting in some epiphora and difficulty in looking downwards. There had never been any pain, and the skin overlying the lesion was intact. The patient had also noticed a watery discharge and obstruction to breathing in the left nasal passage all during this time. Except for the local pathology about the nose, the patient had no complaints and felt quite well.

Examination revealed a firm subcutaneous swelling over the area of the left side of the nose. Nearer the left eye the lesion appeared more intimately connected with the overlying skin, although the latter was intact. Intranasal examination revealed considerable ulcerative tissue about the root of the inferior turbinate and extending upwards. Touching this tissue caused movement of the lesion seen externally. The middle turbinate and the rest of the passage appeared uninvolved. Nothing of note was seen in the right nasal passage, the nasopharynx, pharynx, hypopharynx, or larynx. A biopsy of the margin of the ulcerative lesion was reported as showing "acute necrotizing inflammation of fibrous connective tissue."

After consultation with the staff pathologist, it was decided to explore the lesion externally. The patient entered Wesley Memorial Hospital on Sept. 18, 1951. Laboratory work showed results of the Kahn test to be negative, and the urine and blood count satisfactory. The plasma proteins were within normal limits. X-rays of the nasal sinuses did not show sinus pathology. The x-rays of the chest were essentially negative. At operation an incision was made halfway between the midline of the nose and the inner canthus of the left eye. A fairly firm, grayish, tumor-like lesion was found and dissected free from the underlying tissues. However, on dissection towards the left lower eyelid, it was noted that the pathological tissue merged with the subcutaneous tissue, so that a clean-cut dissection would be impossible. A probe was found to extend from the ulcerative lesion into the nose, there being a defect of the nasal bone here. Complete removal would have necessitated a radical procedure, so the operation was terminated, and the wound was closed.

The pathologic diagnosis was "subacute inflammation of fibrous connective tissue." In describing the microscopic appearance the report read in part, "The inflammatory cells consist for the most part of large mononuclear leucocytes, but there are scattered neutrophilic leucocytes and numerous eosinophiles as well as a moderate number of plasma cells" (Fig. 1).

The patient left the hospital, and the incision remained healed. In November, 1951, the skin overlying the operative area became red in color, but there did not appear to be any inflammation. The left nasal passage revealed the same ulcerative appearance as before. On Jan. 14, 1952, the patient was seen again, and he stated that during the past few weeks the

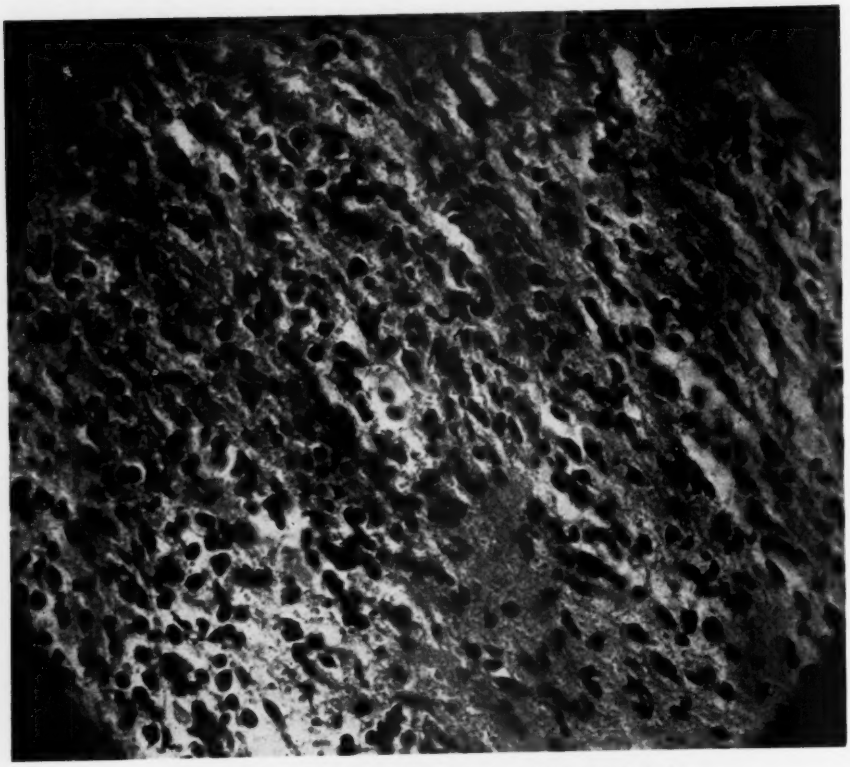

Fig. 1.—Subacute inflammatory tissue typical of the lesion.

Fig. 2.—Appearance of patient at start of corticotropin therapy.

operative incision had given way and an ulcer had developed. Examination showed definite external ulceration, covered with secretion, and with a firm red, raised border. The secretion tended to accumulate in the inner canthus of the eye. Cultures were taken but were negative for yeasts, molds, and fungi. No tubercle bacilli were found, but there was a moderate growth of diphtheroids and a few Diplococci pneumoniae. Intranasal examination revealed extension of the process along the floor of the nose to the septum and upward to near the upper septal border. The appearance of the right nasal passage and of the nasopharynx and pharynx was within normal limits. A photograph of the patient taken on reentry to the hospital is shown in Figure 2. On Feb. 1, one of us (N. P.) took biopsy specimens from the external ulceration and from several areas of the raised borders. Again the pathologic report was inflammation.

In an effort to control secondary infection, penicillin and streptomycin were given intramuscularly, and bacitracin and tyrothrycin ointments were applied locally. However, the lesion became worse, spreading more towards the left eye and cheek, and it was decided to try corticotropin or cortisone. Dr. David Markson was called in consultation and asked to direct the treatment. The patient was given 25 mg. of corticotropin intramuscularly, four times a day. He was placed on a low-salt diet and the intake-output, weight, and blood pressure were charted. No complications of any kind were noted as a result of the treatment. After five days, the same dose of corticotropin was given three times a day for 12 days, and then 17 mg. was

Fig. 3.—Healed condition seven months after termination of treatment.

given three times a day for 8 days. At about the end of two weeks of treatment a definite improvement in the lesion was noted, and at the end of three weeks the contour of the lesion was almost flat and the skin appeared to be rapidly filling in. The left nasal passage was more open, but crusting was noted over the involved area. Use of corticotropin was stopped after 25 days of treatment, and the patient went home to his farm. The facial lesion continued to heal, and has remained healed, without further treatment. Now, seven months since therapy was stopped, it is practically impossible to detect any evidence of the external lesion (Fig. 3). The patient is still bothered with some intranasal crusting, but after removal of the crusts the nasal membrane is smooth and intact over the atrophic inferior turbinate and adjacent area.

SUMMARY AND CONCLUSIONS

On the basis of the type of nasal granuloma in our patient, as judged by its development, course, and laboratory finding, a diagnosis of lethal granuloma was made. Fortunately corticotropin was available, and under its influence the lesion healed, and it has remained healed for seven months. It is hoped that this will be permanent, and that others treating this condition will have as satisfactory a result.

LARYNGEAL SYNCOPE AND HOARSENESS

IRL H. BLAISDELL, M.D.
AND
DAVID W. BREWER, M.D.
SYRACUSE, N. Y.

SPACE-OCCUPYING intralaryngeal muscle implantation for correction of symptoms associated with arytenoidal dislocation and resultant cordal fixation in wide abduction is an effective surgical procedure, and was used in the following instance.

REPORT OF A CASE

Mr. W. C., a white man, aged 27, was first examined in our office on March 18, 1952, because of symptoms of an acute maxillary sinusitis. The clinical findings corroborated the history. In addition, hoarseness of marked degree was evident.

Initial vocal difficulty occurred during childhood when an injury to the neck occurred. Memory of circumstances and symptoms associated with this was vague. However, mild hoarseness dated back to this incident.

The patient was inducted into the Army in 1943, and the medical examiner noted some laryngeal problem with the technical details of which the patient was unfamiliar.

Subsequent to this, while on active duty, he was struck in the neck by a rifle butt. As a result of this second injury to his larynx, extreme hoarseness developed and remained up to the time of our initial examination. After his discharge no compensation for the laryngeal injury was allowed, inasmuch as some previous laryngeal difficulty had been recorded on his induction physical examination.

After the second injury the patient's chest increased 4 inches (10 cm.) in circumference and frequently an attack of syncope occurred whenever a lengthy conversation was attempted. After approximately 10 minutes of talking, he would "black out." Difficulty in carrying or lifting heavy articles also was noted. He had been told upon discharge from the Army that he had a complete paralysis of his left vocal cord.

Mirror examination of the larynx in our office revealed the left cord fixed in wide abduction with absence of the arytenoid eminence on the same side. The patient constantly used both inspiration and expiration in attempting to close the glottis for phonation. What sounds were produced were extremely low pitched, breathy, and markedly hoarse. The syncopal attacks were thus related to hyperventilation.

It was our opinion that laryngeal traumata had resulted in a complete dislocation of the left arytenoid with resultant fixation of the left cord in wide abduction. Surgery for attempted relief of syncopal attacks and possible improvement of voice was proposed, and was accepted by the patient.

On April 29, 1952, the patient was prepared for surgery at Syracuse Memorial Hospital. Following tracheotomy through the fourth tracheal ring, anesthesia was induced by thiopental sodium and the patient was then carried on cyclopropane. A 3-inch incision was made in the left side of the neck extending from the midpoint of the thyroid cartilage laterally and slightly upward. The thyrohyoid muscle was divided for more adequate exposure and the larynx rotated to the right exposing its posterior portion. Identification of the left arytenoid cartilage was made and it was found to be displaced posteriorly and laterally, bound down by dense partially calcified adhesions. These were released, and the arytenoid was removed. The medial perichondrium of the thyroid cartilage was elevated by blunt dissection. At this point, direct laryngoscopy revealed the left cord now approximating the right cord in the midline. However, it was very flaccid and

it was felt that the midline position could not be maintained. For this reason, a portion of the divided thyrohyoid muscle was resected and placed between the thyroid cartilage and the medial perichondrium lateral to the vocal process. Absorbable gelatin sponge (Gelfoam) packing was used about this to maintain hemostasis. With a Penrose drain placed behind the thyroid cartilage next to the esophagus the wound was closed with interrupted subcutaneous catgut sutures and the skin closed with silk.

The following day the patient had a fairly good voice, which, although husky, was considerably improved over his preoperative voice. The drain was removed in 24 hours, and the tracheotomy tube was removed on the sixth postoperative day.

During the first several postoperative days laryngeal edema of moderate degree was present, but this subsided during the first week.

Voice improvement continued, and on July 16, mirror laryngoscopy revealed that the cords approximated very well. Even slight motion in the left cord was evident; the patient could talk at length without any attacks of syncope. Both preoperative and postoperative voice recordings were made.

1100 E. Genesee St.

Clinical Notes, New Instruments and Techniques

ESOPHAGEAL CURETTE

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All endoscopists who have to do with esophagoscopy and the problems of obtaining suitable material, either for biopsy or for cytological study, know all too well that there are occasional cases in which the obtaining of such material presents difficulties little appreciated by those operating in more open fields. As an aid in obtaining material when biopsy is too dangerous, when the area for biopsy cannot be well visualized, or when only material for cytological study can be obtained, the esophageal curette is presented (Fig. 1).

The instrument to be described fulfills, at least in part, these needs. It is presented to the bronchoesophagologists, and to them alone, as it is an instrument which requires long endoscopic experience to operate safely. The successful use of this instrument should promote closer teamwork between the thoracic surgeons and the bronchoesophagologists.

INSTRUMENT

The instrument consists of a handle 80 cm. in length, with five different heads, or curettes proper, attached in such a way that they tighten on the handle as they are used rather than become loose and drop off. The handle may appear to be overlong at first glance, but, when one considers that certain of the curettes are operated by rotation, it becomes apparent that such must be the case if visualization is to be maintained during this maneuver; the maneuver of rotation itself precludes the shorter handle of the offset variety so common in endoscopic instruments.

The curette heads themselves are double cups with a "scraping," not a cutting, blade in the lower portion of the cup. Three of these have straight blades, which take the specimen as the bullet-shaped cups are withdrawn (Fig. 2). Two of the heads have blades which peel off the desired specimen when rotated, after the fashion of the well-known countersink. One of these heads has the blade on the side, the other on the end (Fig. 3).

After instrumentation the double cups are opened, and the specimens can be withdrawn and either sent to pathology or directly mounted on slides preparatory for staining after the method of Papanicolaou.

Figure 4 shows the actual size of the curetting heads.

TECHNIQUE

The curettes with the straight blades are passed into the pathological area, much as is an esophageal dilator. The instrument is then withdrawn, and the specimen is thus collected.

The curettes with the blades designed for rotation are passed in a similar fashion. The one with the blade on the side is used in the collar type of lesion, and rotation to the right (clockwise) when the blade is within the collar usually results in a satisfactory specimen. The curette

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The esophageal curette and the various types of collecting cups are available to the profession through the Electro Surgical Instrument Company, 29 North Water Street, Rochester, N. Y.

From the Department of Surgery, Division of Otolaryngology, University of Rochester School of Medicine and Dentistry, Rochester, and in conjunction with the Bronchoscopic Service of the Batavia Veterans Hospital, Batavia, N. Y.

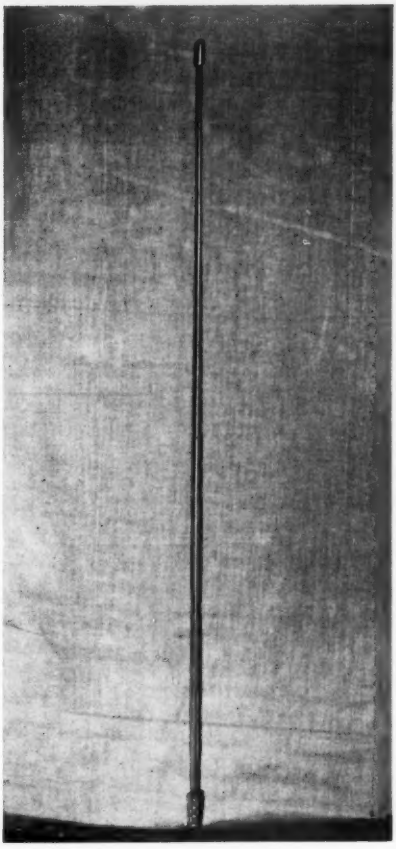

Fig. 1.—Esophageal curette.

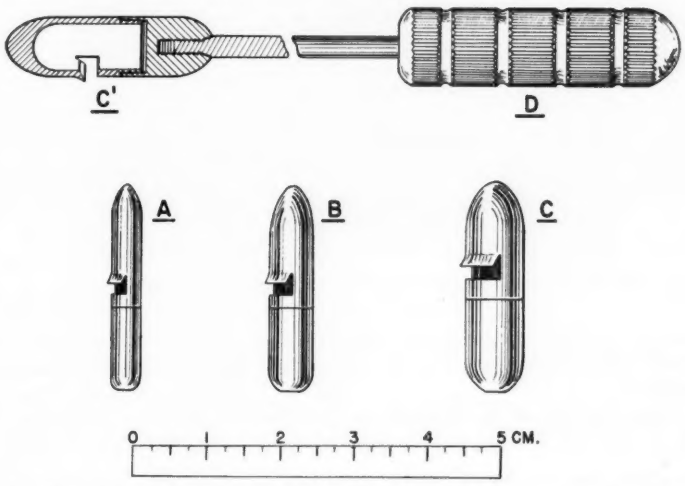

Fig. 2.—Schematic drawing of curette heads, showing details of construction of collecting cups.

with the rotational blade at the end is used on the hard, flat type of lesion; it is passed to the lesion, where the rotation to the right (clockwise) results in the peeling off of a specimen, just as a carpenter's countersink works on wood.

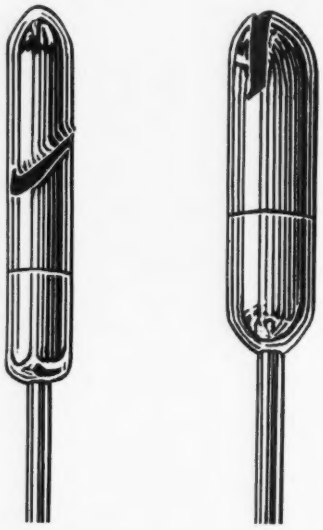

Fig. 3.—Curette heads with rotation type of blades.

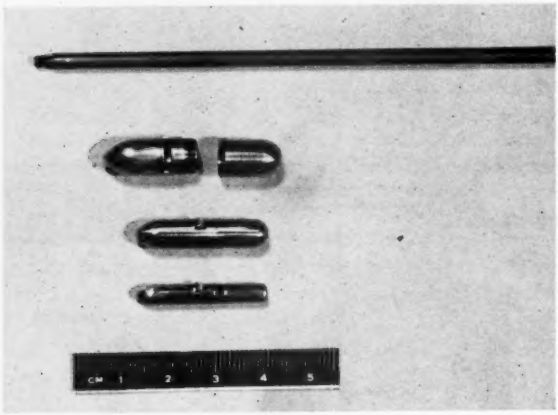

Fig. 4.—Curette heads, actual size. Largest cup has been opened.

SUMMARY

A new instrument, an esophageal curette, with several types of cutting or scraping heads has been presented.

This curette has been found satisfactory for the use for which it was designed, i. e., the obtaining of diagnostic material in esophageal lesions not approachable by the usual biopsy forceps.

It is again pointed out that the instrument, while satisfactory and safe when used by an experienced endoscopist, should not be used by the occasional bronchoscopist.

Progress in Otolaryngology

PLASTIC SURGERY DURING THE YEAR 1951

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

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AND
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NEWARK, N. J.

IN REVIEWING the 1951 literature on plastic surgery that might appeal to the otolaryngologists we are impressed with the number of excellent articles appearing in a wide variety of medical journals. This is gratifying to find, and the number apparently has in no way lessened the quality of articles published in the *American Journal of Plastic and Reconstructive Surgery* and the *British Journal of Plastic Surgery.*

The *American Journal of Plastic and Reconstructive Surgery* contains an abstract section of articles published in other periodicals, and bound copies of the journal provide a complete and modern reference for the otolaryngologist who does some plastic surgery.

CURRENT TRENDS IN PLASTIC SURGERY

Ox Cartilage.—Ox cartilage in a preservative, as supplied by Armour and Company, has been advocated by Sir Harold Gillies, of England, as a grafting material to repair saddle nose and other deformities. It has the important advantage of being available in large quantity and has been used clinically by an increasing number of plastic surgeons here and abroad.

Mr. North, of England, in the Foundation Award paper presented Oct. 2, 1952, at the Annual Meeting of the American Society of Plastic and Reconstructive Surgery, reported observations by Professor Kilner and his Oxford Group on 200 ox-cartilage grafts followed up until three years following transplantation as follows: The foreign material is often well tolerated in human tissues initially, but considerable absorption occurs in the graft after a period of time. The connective tissue which replaces portions of the graft weakens its structure as regards support and reduces the bulk of the graft.

From this report it is evident that autogenous cartilage should still be the surgeon's first choice for grafting material and that preserved human cartilage from another human being should be second choice. Autogenous cartilage is usually indicated for use in children and young patients with a long life expectancy. Preserved human cartilage may be used in older patients and in patients on whom the chest operation to obtain rib cartilage is not advisable.

The fate and the clinical value of living homocartilage grafts compared with that of dead preserved homocartilage grafts have not as yet been determined.

The senior author (L. A. P.) wishes to reemphasize the value of using several segments of the patient's own septal cartilage reinforced with septal bone to fill relatively deep saddle depressions in the nose. The patient's alar cartilage may be used to "cap" the other materials and thus provide a smooth contour beneath the nasal skin.

Dermal Fat Grafts on a Pedicle.—Another interesting trend discussed at the recent Annual Meeting of the American Society of Plastic and Reconstructive Surgery, in New York, was the use of dermis and fat as a buried graft with an attached pedicle carrying adequate blood to insure complete survival of the fatty layer in the graft.

Dr. Charles G. Neumann, of New York City, has taken sections of the buried dermis and noted that the glands and hair follicles atrophy without cyst formation in about the same way as the glands and hair follicles atrophy in free buried dermal grafts without an attached blood supply.

The dermal fat grafts on a pedicle show little if any reduction in bulk in the fatty part of the graft and thus they are useful in filling out deep depressions in the face (hemiatrophy) and for reconstructing the contour of small or deficient breasts.

The fatty part of a free dermal fat graft eventually loses 50% or more of the fatty tissue and about 15% of the dermis one year or more following transplantation.

Rhinoplasty.—There is a growing tendency among plastic surgeons to avoid overcorrection of the nose, especially as regards excessive shortening. The successful rhinoplasty should result in a reasonable degree of improvement in the patient's appearance (total face), but the nose should not look as though it had been operated upon. A good-looking nose generally is a nose which blends so well with the face that the nose itself is not recognized as a separate entity.

It appears that good nasal plasties are accomplished by an increasing number of otolaryngologists who have talent for this special field, as well as by a number of doctors limiting their work to plastic surgery. Plastic surgery will always overlap the work of other specialties to some extent, and the degree of this somewhat competitive overlapping will vary in different localities and hospitals.

The patient with a nasal deformity and obstruction to breathing will tend to select the man in his locality who does the best work, regardless of whether he is an otolaryngologist or a general plastic surgeon.

Cleft Palate Deformity; Age at Operation.—Numerous studies have been made during the past five years on the development of the facial bone structure in children with cleft palate deformity. These reports demonstrate significant underdevelopment of the maxilla in patients who were operated on early (before the end of the fourth year) and relatively normal development in patients operated on after the end of the fourth year of life or not operated on at all. In the cases measured in these studies operation had been done by a number of different surgeons with varied training who used a wide variety of surgical methods for the repair. Thus the group of children studied did not represent the results obtained in the average well-managed plastic service using the same surgical technique for all cases.

In this review Prioleau, Bruckl, and Rosenthal appear to favor late operation for cleft palate deformity.

At the recent Plastic Society Meeting in New York a growth study of 133 cases in which operations had been done for cleft palate was presented by Drs. L. A. Peer, R. Haggerty, M. B. Collito, F. S. Hoffmeister and others. In all these cases the defect had been repaired by the Warren Davis bone-flap method, but the authors failed to find any significant underdevelopment of the maxilla, although 80% of the children had been operated on before the second year of life. The speakers also

demonstrated that children operated on before they begin to talk have less nasality than children who have their clefts repaired after they have learned to talk.

The material presented in this paper would induce surgeons to favor early operation for cleft palate deformity on the basis that good speech is more important than minor deficiencies in the maxilla.

GRAFTING

Conway and his colleagues'[1] study of the circulation in whole thickness autogenous skin grafts was done by the transparent chamber technic originally described by Algire and Legallis. By this technic a segment of soft tissue may be viewed microscopically through the plastic window for a prolonged period of time. Significant observations include the early plasmatic circulation, which is replaced by capillary budding and by parallelization of young vessels toward the graft. The ingrowth of young blood vessels from the subcutaneous tissue bed of the skin graft keeps pace with the marginal development of blood vessels. Various authors, Conway,[2] Barron,[3] and Braithwaite,[4] report their observations on the clearance of radiosodium as a test of circulatory efficiency in tubed pedicles and flaps. Conway found that if the rate of disappearance of radioactive sodium from the tubed pedicle is approximately equal to or more rapid than that from the injection in the corresponding control area on the opposite side of the body, then division and migration of the pedicle can be carried out successfully. Measured amounts of radioactive saline were injected by Barron into tubed skin pedicles. A postulation is offered by Braithwaite, Farmer and Herbert[5] that the absorption rate is proportional to the endothelial surface available for absorption and not to the blood flow.

The vascular changes that may be evident in a tubed pedicle when it is raised or transferred are similar to the manifestations of reactive hyperemia, as stated by Braithwaite.

Hynes[6] describes a form of treatment to avoid stagnation of blood in tubed pedicles and in direct flaps by keeping it moving in and out of the distal end of the flap. He uses gravity passively to fill and empty the flap of blood. To express blood actively from the flap he uses a venous occluder directly over the flap and another venous occluder around the extremity above the level of the pedicle or flap, to fill

1. Conway, H.; Joslin, D., and Stark, R. B.: Observations on the Development of Circulation in Skin Grafts: I. Technique of Adaptation of the Transparent Chamber Technique to Study of the Circulation in Skin Grafts, Plast. & Reconstruct. Surg. **8**:194 (Sept.) 1951. Conway, H.; Stark, R. B., and Joslin, D.: Observations on the Development of Circulation in Skin Grafts: II. The Physiologic Pattern of Early Circulation in Auto-Grafts, ibid. **8**:312 (Oct.) 1951.

2. Conway, H.; Roswit, B.; Stark, R. B., and Yalow, R.: Radioactive Sodium Clearance as a Test of Circulatory Efficiency of Tubed Pedicles and Flaps, Proc. Soc. Exper. Biol. & Med. **77**:348 (June) 1951.

3. Barron, J. N.; Veall, N., and Arnott, D. G.: The Measurement of the Local Clearance of Radioactive Sodium in Tubed Skin Pedicles, Brit. J. Plast. Surg. **4**:16 (April) 1951.

4. Braithwaite, F.: Some Observations on the Vascular Channels in Tubed Pedicles, Brit. J. Plast. Surg. **4**:28 (April) 1951.

5. Braithwaite, F.; Farmer, F. T., and Herbert, F. I.: Observations on the Vascular Channels of Tubed Pedicles Using Radioactive Sodium, Brit. J. Plast. Surg. **4**:38 (April) 1951.

6. Hynes, W.: The "Blue Flap": A Method of Treatment, Brit. J. Plast. Surg. **4**:166 (Oct.) 1951.

it with blood. Jenney [7] advises no dressings except for a single layer of gauze over the donor site and recipient areas. Over the recipient areas petrolatum may be used as backing without dressing. He depends on the clot to stick the graft to the body and not to bandages in an attempt to achieve the same result. If the area is dry, a few cubic centimeters of blood from a vein is applied. Jenney feels that with the advent of corticotropin (ACTH) the opportunities to treat grafts and wounds by open methods are extended. Immediately after an injury or operation, as pointed out by Jenney,[8] is the best time for free skin grafting. Important factors to be considered in the open method are: The epidermis has no direct blood supply but lives on tissue fluid. Clot is body glue. Secondary tissue is substitute tissue. Protection of a properly applied graft is the essence of success. Complete immobilization is not necessary for success.

LeVeen and his associates [9] experimented with hyaluronic acid, which contributes significantly to the interstitial cement substance in normal tissue. The undersurface of a full-thickness skin graft from the abdomen and the recipient site in a group of rats were painted with 1% hyaluronic acid solution. It was found that the hyaluronic-acid fixed grafts were invariably more adherent to the recipient site as tested by skin traction immediately after operation.

In his experience Berson [10] found that autogenous derma-fat-fascia grafts are best used to correct contoural defects due to total or subtotal loss of subcutaneous tissue of the face, neck and breasts.

BONE AND CARTILAGE

Albertengo [11] found no difficulties in the use of preserved bone, the results being comparable to those from employing autogenous bone, both kinds in the form of small cancellous bone chips, excluding cortical bone. No antibiotics were given, even when the buccal mucosa was opened. It is believed that immobilization and pressure are more important to overcome the effects of contamination than antibiotics or antiseptics. Ford,[12] however, does not believe that pressure is an important factor, as has been stated. New bone which appeared early arose from cancellous bone inside the host to fuse the autogenous bone grafts in the iliac bone. There was no evidence that the bone grafts retained any viability or that any new bone arose from them.

Allen and Goldman [13] raise the question whether the nose offers an ideal bed for a bone transplant for the reason that the graft when in position is in intimate contact with periosteum or bone only at its cephalic portion. The intimate contact

7. Jenney, J. A.: Clot Fixation in the Open Method of Free Skin Grafting, Plast. & Reconstruct. Surg. **8**:299 (Oct.) 1951.

8. Jenney, J. A.: Open Method of Free Skin Grafting, Am. J. Surg. **82**:396 (Sept.) 1951.

9. LeVeen, H. H.; Franklin, E., and Barberio, J. R.: The Use of Hyaluronic Acid for Fixation of Skin Grafts, Surgery **29**:743 (May) 1951.

10. Berson, M. I.: Surgical Repair of Subcutaneous Tissue Defects, J. Internat. Coll. Surgeons **16**:436 (Oct.) 1951.

11. Albertengo, A.: Cancellous Bone Chips as a Modeling Material in Plastic Surgery, An. cir. **15**:166 (Dec.) 1950.

12. Ford, L. T.; Lottes, J. O., and Key, J. A.: Experimental Study of Effect of Pressure on Healing of Bone Grafts, A. M. A. Arch. Surg. **62**:475 (April) 1951.

13. Allen, B. I., and Goldman, I. G.: Absorption of Nasal Autogenous Cancellous Bone Grafts, Eye, Ear, Nose & Throat Month. **29**:432 (Aug.) 1950.

of bone with bone at both ends of the graft is not present. Such contact favors the exchange of blood supplies and osseous elements which are ordinarily present in successful bone grafting elsewhere in the body. Peer [14] found that autogenous septal bone grafts without periosteum in contact with unlike tissue retained their normal bone structure with living bone cells up to five years following transfer. Many of the cells of cancellous iliac and rib bone grafts surviving transplantation as living cells tend to maintain the calcified matrix of the graft, provided osseous union occurs at the point of contact with host bone. Cancellous iliac and rib bone grafts lose their calcified structure when they are transplanted in contact with unlike tissue.

In the technic of storing bone by refrigeration, as described by Herbert,[15] a patient avoids a second wound and the loss of bone from some other part of the body. Almost unlimited bone is available to the surgeon, and he is consequently able to insert very large grafts. Vaccarezza [16] points out the difficulties in organizing a bone bank, with preservation of the material by freezing or by merthiolate solution. He has been using bone preserved in tincture of "Parophenol." The bone is obtained from ribs resected in the course of thoracoplasties.

Gillies [17] gives credit to those who pioneered in the use of zoografts. Xiphisternum cartilages from 18-month-old heifers are placed in merthiolate solution, later parboiled for one minute, and placed in sterile bottles containing 1:4,000 solution of merthiolate in saline. Gillies and Kristensen recommend preserved ox cartilage for routine plastic procedures, particularly for reconstruction of the nose.

SCALP AND SKULL

For primary traumatic avulsions of the scalp Marcks and his colleagues [18] use split skin grafts as soon as possible. They treat burns of the scalp as they do those in other areas. If periosteum is involved, they preferably excise the outer table rather than drill holes. The authors would rather delay a flap prior to transfer, but this procedure is not necessary in the average case. All the secondary repairs in their series of patients have been possible by using adjacent hair-bearing skin. Spina [19] says that no ideal operative procedure has been found for patients with extensive loss of the scalp. In the present period of his experience—which is quite extensive, for he works in an important industrial zone—scalping is treated with free grafting of the area. The graft is applied as soon as possible; the thick intermediate type seems to give the best results. Flaps or tubular grafts from a distance are used only in selected cases. As emphasized by Wynn,[20] the use of a predetermined pattern of a scalp defect gives the surgeon an idea of the amount of skin

14. Peer, L. A.: The Fate of Autogenous Human Bone Grafts, Brit. J. Plast. Surg. **3**:233 (Jan.) 1951.

15. Herbert, J. J.: Homografts and the Bone Bank, J. Bone & Joint Surg. **33-B**:316 (Aug.) 1951.

16. Vaccarezza, O. A.: Parophenol Bone Bank, Bol. y trab. Soc. argent. cirujanos **12**:725 (Nov. 5) 1951.

17. Gillies, H., and Kristensen, H. K.: Ox Cartilage in Plastic Surgery, Brit. J. Plast. Surg. **4**:63 (April) 1951.

18. Marcks, K. M.; Trevaskis, A. E., and Nauss, J.: Scalp Defects and Their Repair, Plast. & Reconstruct. Surg. **7**:237 (March) 1951.

19. Spina, V.: Treatment of the Scalp, Rev. hosp. clin. **6**:41 (Jan.) 1951.

20. Wynn, S. K.: Free Pattern Skin Graft in Total Scalp Avulsion, Plast. & Reconstruct. Surg. **7**:225 (March) 1951.

necessary by allowing him to flatten out the top half of a sphere. He is thus able to suture the skin grafts together before application to the scalp. In this way the operative time is greatly reduced, the blood loss is decreased by eliminating the necessity of direct suture to a granulating surface, and the patient's discomfort is lessened.

In a series of 14 cases of cranial defect, McClintock and Dingman [21] used fresh autogenous iliac bone. They feel that iliac cranioplasty is indicated (1) for areas where the defect is too large for an osteoperiosteal type of graft from another portion of the skull, and (2) for defects where careful contouring is essential for reconstruction of margins, ridges, or prominences of the skull. A full thickness graft may be obtained, or, if desired, the crest may be preserved. In such cases the bone of the crest is split, leaving the outer cortex in place. As iliac bone thins considerably below the crest, the remainder of the graft must be full thickness. The graft is shaped and wired in place. It becomes solid in a few weeks. In McClintock and Dingman's cases the longest follow-up was for two and one-half years. After this period the graft remained less opaque than the surrounding bone but provided excellent contour and function. As stated by Enria and Ferrero,[22] failure in the use of bone grafts and other methods for repairing cranial defects after craniotomy is thought to be due to inadequate vascularization of the grafted tissue. These authors carried out a series of experiments on dogs to prove that vascularization of grafted tissue can be produced by application of a bony paste at the site of the bony defect. The best results were found in the group in which the cranial defect was filled with a mixture of the animal's powdered bone and blood. After 60 days there was complete closure of the bony defect by homogenous newly formed bone.

Since 1945 Aldunate [23] has used an acrylic dust mixed with saline in 14 patients with facial and skull depression. Scoville and McLaurin [24] report on two cases of infants in which tantalum mesh was used to repair congenital bony defects of the skull and spine.

FACE

Ferris Smith [25] states that the sole purpose of various local flaps is to discharge the obligation to the patient rather than exchange one cosmetic disability for another, such as results from grafts and flaps from a distance. He briefly reviews the origin and history of various flaps and points out the basic clinical principles. Relative to the location of the incision, the objective is the finest, least visible scar permitting entire face covering with normal adjacent skin. The author illustrates profusely the application of various types of flaps for lesions in various locations. Some procedures are described in detail.

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21. McClintock, H. G., and Dingman, R. O.: The Repair of Cranial Defects with Iliac Bone, Surgery **30**:955 (Dec.) 1951.

22. Enria, G., and Ferrero, R.: The Possibility of the Use of Bone Paste in Plastic Repair of Cranial Defects, Chir. org. movimento **34**:459, 1950; abstracted, Surg., Gynec. & Obst. **93**:227 (Sept.) 1951.

23. Aldunate, E.: A Plastic Method for Refilling of Facial and Skull Depressions, Plast. & Reconstruct. Surg. **7**:147 (Feb.) 1951.

24. Scoville, W. B., and McLaurin, R. L.: Tantalum Mesh in Repair of Congenital Bony Defects of Skull and Spine, J. A. M. A. **147**:639 (Oct. 13) 1951.

25. Smith, F.: Flaps Utilized in Facial and Cervical Reconstruction, Plast. & Reconstruct. Surg. **7**:415 (May) 1951.

Soderberg [26] presents excellent photographs in war casualties with uniformly good results. These cases offer nothing new, but they demonstrate that these patients are being treated in the proper fashion.

In the primary repair of facial defects with rotation flaps, Hyslop and Wynn [27] found that a minimal amount of distortion of features and a good cosmetic and functional result are obtained if the incisions are planned to conform as closely as possible with the normal lines of the skin. Methods of treatment are given for complications.

To eradicate glabellar wrinkles Foman and his associates [28] insert dermal grafts through incisions made at the inner extremities of the eyebrows. For nasolabial folds dermal grafts are inserted through a small incision along the alar groove. This complete article is well illustrated.

In an excellent article on selecting appropriate lines for elective surgical incisions, Kraissl [29] includes a number of illustrations. The facial lines run uniformly perpendicular to the action of muscles beneath, upon which they are dependent for their formation. In many places these lines are at variance with Langer's lines, with which they are often confused. Fraser [30] points out that the vertical portion from the submandibular incision down to the clavicle crosses Langer's line. Deformities can be obviated simply by making a curved incision in this horizontal part of the incision.

In diagnosing hypertrophy of the masseter muscles in seven patients, Maxwell and Waggoner,[31] of the University of Michigan, observed that inflammatory and neoplastic lesions of the parotid gland and mandible may be excluded readily by palpation. Roentgenographically there was a slight prominence of the angle of the mandible. The condition presented may be of no significance other than its cosmetic effect, but there is suggestive evidence that this may be a pathological as well as a clinical entity. In a case of massive hypertrophy of the right masseter muscle in an 18-year-old woman, as reported by Tempest,[32] no cause for the condition could be elicited. Surgery was not performed.

An attempt was made by Harrison [33] to fix a time in the embryological growth when the developmental arrests occur in Treacher-Collins syndrome. The deduction is made that the causative factor exerts its influence between the 30 and the 50 mm. embryonic stage.

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26. Soderberg, B. N.: Surgical Repairs of Facial Injuries, Plast. & Reconstruct. Surg. **8**:208 (Sept.) 1951.

27. Hyslop, V. B., and Wynn, S. K.: Primary Repair of Facial Defects with Rotation Flaps, Wisconsin M. J. **50**:153 (Feb.) 1951.

28. Foman, S.; Goldman, I. B.; Neivert, H., and Schattner, A.: Face-Lift by Rotation Flaps, A. M. A. Arch. Otolaryng. **54**:478 (Nov.) 1951.

29. Kraissl, C. J.: The Selection of Appropriate Lines for Elective Surgical Incisions, Plast. & Reconstruct. Surg. **8**:1 (July) 1951.

30. Fraser, C. G.: A More Plastic Incision for Radical Neck Dissections, Plast. & Reconstruct. Surg. **8**:465 (Nov.) 1951.

31. Maxwell, J. H., and Waggoner, R. W.: Hypertrophy of the Masseter Muscles, Ann. Otol., Rhin. & Laryng. **60**:538 (June) 1951.

32. Tempest, M. N.: Simple Unilateral Hypertrophy of the Masseter Muscle, Brit. J. Plast. Surg. **4**:136 (July) 1951.

33. Harrison, S. H.: Treacher Collins Syndrome, Brit. J. Plast. Surg. **3**:282 (Jan.) 1951.

Reconstruction of the cheek in one stage, in Borges Recio's [34] opinion, is always a rather difficult procedure. Dieffenbach's technic for repairing the lower lip, with slight modifications, can be used to reconstruct the cheek. Three cases demonstrate the possibilities of lateral flaps. The buccal lining was made by inverting skin flaps from the borders of the loss of substance.

A technic for repairing extensive defects of the upper or lower lip and those of the cheek by means of a bipedicle submandibular flap is presented by Kostrubala and Stokes.[35] The central portion of the undermined flap from the submandibular region may be lined with a split thickness graft as a lining for the newly constructed lip. The split thickness skin lining is sutured to the oral mucous membrane bordering the defect and the defect, and the skin of the flap is sutured to the skin of the face along the upper border of the defect.

Flanagin [36] advises that deep lacerations which radiate from the corner of the mouth not be closed in a straight line but rather with multiple small Z's to prevent contracture deformity. For the best possible function and appearance, lateral fissures should be closed by suturing muscle and skin at a different level from that of closure of the mucosa. For postoperative harelips with a short upper lip and flattening of the nose due to a short columella, Flanagin recommends advancing the premaxillary tissue onto the columella and rotating a wedge flap from the lower lip into the resulting defect in the upper lip. In correcting microstoma in one patient, Szlazak [37] rotated a flap from the lower lip to be continuous with the vermilion of the upper lip, apparently with a good result.

As stated by Byars and Anderson,[38] from the first branchial pouch develop the lining of the middle ear, the mastoid cells, and the Eustachean tube. Its corresponding ectodermal groove produces the external auditory canal and the outer surface of the tympanic membrane. An anomaly of the first cleft thus should be found high in the neck, above the level of the hyoid, below the lower border of the mandible, and probably opening into or in close proximity to the external auditory canal. In three cases reported by the authors, they describe their procedure (Fig. 1). Their method of choice is surgical excision of the lesion under general anesthesia.

Microscopic examination showed stratified squamous epithelium with hair follicles, sebaceous glands, and sweat glands lining the tract. This is in agreement with common findings on examination of other branchial cleft anomalies and would further establish the ectodermal origin of the lesion.

Malunited comminuted fractures of the maxilla, as pointed out by Converse and Jeffreys,[39] may result in marked retrusion of the whole nasomaxillary region. Marked retrusion of the middle portion of the face or dish-face deformity is seen

34. Borges Recio, A.: One-Stage Reconstruction of the Cheek, Bol. Liga contra cáncer **25**:165 (June) 1950.

35. Kostrubala, J. G., and Stokes, R. F.: Submandibular Flap, A. M. A. Arch. Otolaryng. **53**:285 (March) 1951.

36. Flanagin, W. S.: Reconstructive Surgery of the Lip Region, Am. Surgeon **17**:735 (Aug.) 1951.

37. Szlazak, J.: Correction of Microstoma, Plast. & Reconstruct. Surg. **8**:71 (July) 1951.

38. Byars, L. T., and Anderson, R.: Anomalies of the First Branchial Cleft, Surg., Gynec. & Obst. **93**:755 (Dec.) 1951.

39. Converse, J. M., and Jeffreys, F. E.: Nasomaxillary Epithelial Inlay for Dish Face Deformity, J. Oral Surg. **9**:183 (July) 1951.

in syphilitics. The essential anatomic characteristic in many of these deformities is loss of the lining of the nasal cavity. When extreme nasomaxillary retrusion is present and when loss of the upper teeth necessitates the wearing of a denture, it is feasible to extend the denture upward into the nasomaxillary region. This upward extension of the denture fits into the skin-grafted cavity and restores the contour of the soft tissues of the face.

As advised by Brown,[40] early operations are necessary in compound facial injuries to utilize the displaced tissues before they are permanently distorted out of place. Severely injured faces may be repaired in a single primary operation if early evacuation and prompt operative repair are carried out. Various precisions in procedures for facial repair are discussed and illustrated.

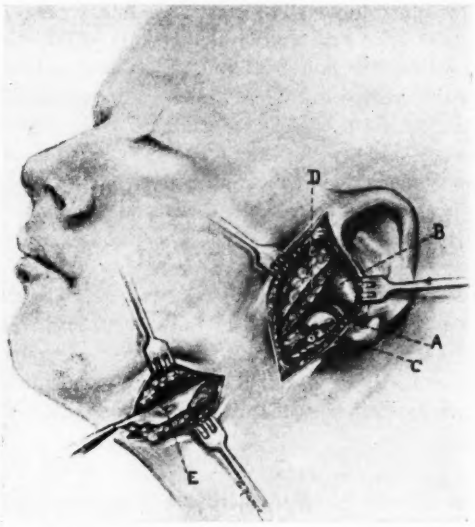

Fig. 1.—Drawing of the operative field showing the two incisions necessary for dissection of the sinus tract. The facial nerve is seen looping over the cartilaginous cuff. *A*, facial nerve; *B*, tragal cartilage; *C*, cartilaginous cuff (termination of tract); *D*, cut edge of parotid gland; *E*, external orifice of tract. (Reproduced with permission from *Surgery, Gynecology and Obstetrics.)*

EAR

In an article of interest to anyone doing surgery on the ear, Altman [41] presents a comprehensive review of malformations of the auricle and the external auditory meatus. This review would serve well to enlighten a person seeking a description of any external aural malformation. Anatomical features and variations in the normal auricle are pointed out. Surprisingly, relief of the auricle is one of the most variable features of the human body. The severer malformations are usually com-

40. Brown, J. B.: Symposium on Clinical Surgery: Plastic Surgical Procedures on the Face for Improvement of the Function and Appearance, S. Clin. North America p. 1325, Oct., 1950.

41. Altman, F.: Malformations of the Auricle and the External Auditory Meatus: A Critical Review, A. M. A. Arch. Otolaryng. **54**:115 (Aug.) 1951.

bined with malformations of the middle ear or of the auricle. An extensive bibliography contains the available literature since 1930 and selected more important earlier publications.

The fundamental factors of the pathology in congenital atresia of the external ear are given consideration by Davis.[42] A surgical technic is proposed, from the viewpoint of the plastic surgeon, for the reconstruction of the external auditory meatus as a preparatory auriculoplasty. If the internal ear is found to function almost normally, the construction of a neomeatus should be planned. The author describes the creation of a cylindrical cavity lined with a skin graft applied as closely as possible to the semicircular canals by making an osteotomy in the antrum.

Ombrédanne [43] reports on 33 operations for aplasia of the ear with atresia of the auditory canal. He certainly seems to oversimplify the reconstruction of the external ear, according to his illustrations. The external auditory canal is created when the child is 6 or 7 years of age. Fenestration is then carried out with a special curette. The canal is lined with a free skin graft and an adjacent pedicled flap.

The purpose of the method to correct prominent ears as described by González-Ulloa [44] is to restore the form of the external ear. The noteworthy feature of this method is the smallness of the skin incision, which is made in the middle of the anthelix on the anterior surface of the skin and through the full depth of the cartilage in the direction of the crus of the anthelix and its extensions.

For the usual type of protruding ear Ragnell [45] uses Luckett's method, with modifications. Reconstruction consists of reshaping the cartilage support and adaptation of the skin capsule to the new relative size. The method described by the author has been tried in 10 cases with fully satisfactory results.

Brown [46] reports a case of bilateral congenital ear atresia in which prostheses supporting glasses and a hearing aid in one ear supplemented surgical operation. On the side in which hearing was present a plastic operation was performed to open the auditory meatus.

EYE

That immediate care be given to thermal and especially chemical burns when the eye is involved is advised by Hughes.[47] Early attention should be given to traumatic injuries, but emergency treatment need be aimed only at combating infection and swelling until complete competent care can be obtained. In this excellent article clear illustrations of a method for suturing a laceration through the entire thickness of the lid margin are included. Hughes uses tongue and groove types of repair (Fig. 2).

42. Davis, J. E.: Congenital Atresia of the External Auditory Meatus, Plast. & Reconstruct. Surg. **8**:173 (Sept.) 1951.

43. Ombrédanne, M.: Thirty-Three Operations for Aplasia of the Ear with Atresia of the Auditory Canal, Ann. oto-laryng. **68**:5 (Jan.) 1951.

44. González-Ulloa, M.: An Easy Method to Correct Prominent Ears, Brit. J. Plast. Surg. **4**:207 (Oct.) 1951.

45. Ragnell, A.: A New Method of Shaping Deformed Ears, Brit. J. Plast. Surg. **4**:202 (Oct.) 1951.

46. Brown, A. M.: Congenital Ear Atresia: Correction with Plastic Surgery and Prostheses, Plast. & Reconstruct. Surg. **7**:327 (April) 1951.

47. Hughes, W. L.: Immediate Care of Eye Injuries, Plast. & Reconstruct. Surg. **8**:281 (Oct.) 1951.

In a case of full-thickness defect of the eyelid following excision of a squamous carcinoma of the middle portion of the upper eyelid, reported by Callahan,[48] the tarsal portion was partially closed and a full-thickness graft of skin, eyelashes, and tarsus from the opposite upper lid was transplanted. A halving type of joining was used in suturing this graft in place and also in repairing the defect of the opposite upper eyelid.

Dupuy Dutemps in 1927 described the use of a single arm pedicle from the upper lid for full-thickness defect of the lower lid. In 1928 Ferris Smith added a skin flap, with either a double pedicle or a pedicle at either the internal or the external canthus. This is elevated from the midportion of the upper lid and sutured into the defect. In the method described by Manchester,[49] following excision of the lower lid lesion with a ¼ in. margin of normal tissue on each side, a conjunctival flap corresponding in width to the defect is freed from the lower fornix

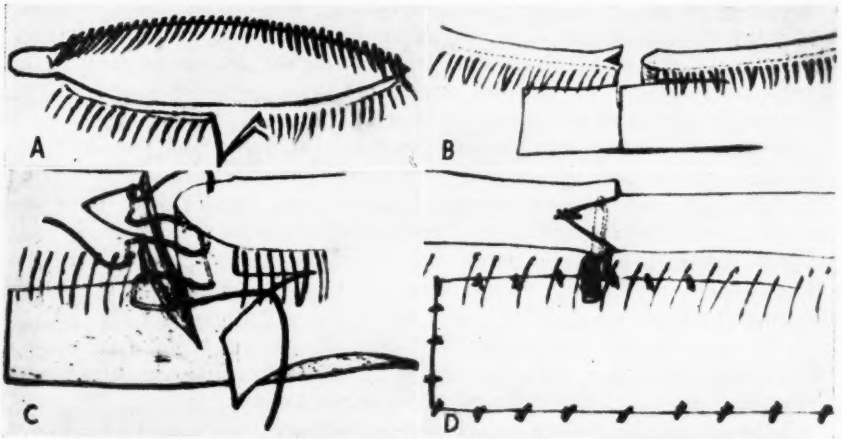

Fig. 2.—*A*, laceration through entire thickness of lid margin. *B*, method of dissection of tongue at one end of laceration and groove at other end, with skin flap to support marginal union. A corresponding area is denuded to accept the supporting flap. *C*, each end of double-armed suture starts through conjunctiva and tarsus, emerges in base of groove, and passes through tongue and through outer lip of groove. *D*, double-armed suture pulled up snugly and flap sewn in position. (Reproduced with permission from *Plastic and Reconstructive Surgery.*)

and the lower bulbar conjunctiva. The skin defect is repaired by a double-pedicled flap from the upper lid, which must fit in the defect without tension.

In Lee's [50] experience the Szymanowski modifications of the Kuhnt procedure for the correction of noncicatricial ectropion has been very satisfactory cosmetically. Not infrequently, however, the annoying epiphora persists because of the lateral displacement of the lower lacrimal punctum, which remains everted. In

48. Callahan, A.: The Free Composite Lid Graft, A. M. A. Arch. Ophth. **45**:539 (May) 1951.

49. Manchester, W. M.: A Simple Method for the Repair of Full-Thickness Defects of the Lower Lid with Special Reference to the Treatment of Neoplasms, Brit. J. Plast. Surg. **3**:252 (Jan.) 1951.

50. Lee, O. S.: An Operation for the Correction of Everted Lacrimal Puncta, Am. J. Ophth. **34**:575 (April) 1951.

Lee's procedure to correct this deformity an incision is made along the margin of the lacrimal portion of the lower lid, extending nasally. The incision of the lacrimal portion of the upper lid is completed to join the incision below. A vertical incision from the nasal extension, with undermining, is then made to form a triangular flap. The lacrimal portions of the upper and lower lid margins are fused by suture. The skin flap is trimmed and sutured in place, with the lower punctum in the corrected position.

In a procedure to relieve senile entropion Fox [51] first splits the lateral half of the lid through the gray line into two layers. A base-down triangle of tarsus is excised. A vertical 15 by 8 mm. ellipse of skin and orbicularis is excised just below the lateral canthus. The tissues are then closed. The condition on 14 eyelids in 10 patients was corrected by this procedure.

A method to cover defects in the sclera is described by Hartman [52]; in this method a graft of thin oral mucous membrane is obtained and sutured in place. Suturing should be carried well into the cul-de-sac, and a plastic oval conformer with a central opening that is slightly larger than the cornea should be inserted. Conjunctival grafts, which give a better color match, are obtained by everting the upper lid and taking a strip from the superior portion of the conjunctival sac. This is sutured in place, and a conformer is inserted.

As stated by Pickrell and his associates,[53] even though an eye may be blind, tattooing a corneal scar will conceal a conspicuous and embarrassing deformity. They have used implantation of insoluble pigments more than 75 times during the past six years, without complication. Patients with congenital opaque cornea, post-traumatic corneal scars, conjunctival flaps, operative defects of the iris, heterochromia, polychromia, and colobomas have been tattooed, with pleasant results for the surgeon and patient.

In an excellent article, Castanares [54] distinguishes the herniation of intraorbital fat from blepharochalasis and ptosis adiposa (a misnomer). His surgical approach is described; this can affect either the upper or the lower lid or both.

In the case of a 59-year-old woman reported by Ersner, Morse, and Alexander,[55] the anterior wall of the antrum was found to be completely eroded by a tumor. The medial wall of the antrum, the inferior turbinate, and the anterior and posterior ethmoid cells were removed. The eyeball was elevated from the floor of the orbit, and a piece of No. 60 wire mesh of stainless steel was inserted to fill in the defect.

The use of a plastic substance, Paladon, is recommended by Walser [56] for implantation in all cases in which soft tissue surgery will not suffice, particularly in cases in which the bony orbital margin has been destroyed.

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51. Fox, S. A.: Relief of Senile Entropion, A. M. A. Arch. Ophth. **46**:424 (Oct.) 1951.

52. Hartman, D. C.: Use of Free Grafts in Correction of Recurrent Pterygia, Pseudopterygia and Symblepharon, California Med. **75**:279 (Oct.) 1951.

53. Pickrell, K. L.; Edwards, B. F.; Broadbent, T. R.; Wilde, N. J., and Metzger, J. T.: Corneal Tattoo for Restoration of Eye Color, Plast. & Reconstruct. Surg. **7**:261 (April) 1951.

54. Castanares, S.: Blepharoplasty for Herniated Intraorbital Fat, Plast. & Reconstruct. Surg. **8**:46 (July) 1951.

55. Ersner, M. S.; Morse, H. R., and Alexander, M. H.: Reconstruction of the Orbital Floor Using Stainless Steel Wire Mesh, A. M. A. Arch. Otolaryng. **53**:658 (June) 1951.

56. Walser, E.: The Use of Paladon as a Heteroplastic Implantation Material in Bony Defects of the Orbit and Its Vicinity, von Graefes Arch. Ophth. **149**:355, 1949; abstracted, Quart. Rev. Ophth. **7**:91 (March) 1951.

In a case of dacryocystitis, reported by Wilde,[57] the same approach was made as for the Toti-Mosher operation. A piece of tubing was inserted into the nose through new bony ostium and sutured through a posterior window made in the lacrimal sac.

As reported by Fox,[58] severe cripping postencephalitic blepharospasm which caused the patient's eyes to be closed practically all the time was markedly relieved by a resection of the orbicularis muscle of the entire upper eyelid area except the small tarsal portion. Voluntary closure of the eyes was unimpaired by the procedure.

NOSE

Bames [59] describes his surgical method on a nose that is anatomically and physiologically normal. Usually in an office procedure he raises the skin over the nasal bones with a periosteal elevator, but has never raised periosteum, contrary to consensus and teaching instruction, in over 25 years of rhinoplasty. The author questions why it should be raised. That part of the bone taken away may be removed with or without periosteum. In that part of the bone which remains the periosteum should be left as undisturbed as possible. Excellent illustrations are included in this article.

In Neivert's [60] procedure, after the usual elevation of soft tissues the saw is placed on the approximate line and the usual bones and septum are cut across. The cuts are continued upward into the solid bone with a chisel to the region of the frontonasal suture. This mass of bone is separated from the articulation, in one piece.

Erich [61] discusses the problems that arise in correcting nasal deformities involving the bony and cartilaginous framework. Only in those cases in which a septal deflection is associated with external deflection and deformity of the nose does he consider nasal plastic operation combined with submucous resection of the septum to be advisable. When septal deflection is not associated with external deformity, he believes that resection of the septum should be performed first and the plastic operation deferred for three or more weeks. In traumatic deflection and displacement of the nasal bones, lateral cartilages, and septum, he obtains better results by following Kazanjian's technic rather than other procedures. When the transplantation of tissue or the insertion of some foreign material is required to build up the contour of the nasal bridge, the use of fresh autogenous cartilage grafts is preferred at the Mayo Clinic.

Becker [62] divides septal and external nasal deformities into developmental and traumatic groups. The traumatic group is subdivided into three types: (1) the lateral type, (2) the depressed type, and (3) the laterofrontal type. It is maintained

57. Wilde, J.: Dacryocystorhinostomy: A Case Report, Using Polyethylene Tubing, Plast. & Reconstruct. Surg. **8**:234 (Sept.) 1951.

58. Fox, A.: Relief of Intractable Blepharospasm: A Preliminary Report, Am. J. Ophth. **34**:1351 (Oct.) 1951.

59. Bames, H. O.: Elective Rhinoplasty, Plast. & Reconstruct. Surg. **8**:113 (Aug.) 1951.

60. Neivert, H.: Reduction of Nasofrontal Angle in Rhinoplasty: Disarticulation Technic, A. M. A. Arch. Otolaryng. **53**:196 (Feb.) 1951.

61. Erich, J. B.: Nasal Deformities Involving the Bony and Cartilaginous Framework, S. Clin. North America **30**:1119 (Aug.) 1950.

62. Becker, O. J.: Problems of the Septum in Rhinoplastic Surgery, Tr. Am. Acad. Ophth. **55**:244 (Jan.-Feb.) 1951.

that the septum should be manipulated into position by vertically cutting and removing narrow sections of cartilage and by fracturing the bony portion into position.

Fomon and associates in 1948 reported that the upper lateral cartilages were capable of maintaining the profile projection of the nose even when separated from the septum, provided the membranes remained intact. This support entailed technical difficulties in that it had to be carried out from below, in the narrowest part of the gable. The authors describe this approach, which provides a better view than other procedures. The continuity of the mucoperichondrium of the septal and lateral cartilages is left intact. A batten of cartilage graft is inserted between the lateral cartilages, and the three are then sutured together. In another article by Fomon and his associates,[63] management of deformities of the lower cartilaginous vault is described, with excellent illustrations included.

As stated by May,[64] the classified intranasal incisions of Joseph give, as a rule, adequate access to the nasal framework for the various steps of rhinoplasty. In marked deformities of the lower or cartilaginous part of the nose the Réthi incision has been found to be extremely valuable. A combination of the Joseph and the Réthi incision is described and illustrated by May. An intervestibular incision parallel to and just within the nostril is combined with an incision across the columella.

In studies carried out on cadaver material by Straatsma and Straatsma,[65] a correlation was established between developmental and mature anatomical relationships. It is apparent that the relationship of the lateral nasal cartilage to the nasal bone is a firm side-to-side apposition with a variable area of overlapping. As the septum is traced cephalad, the anterior portion bifurcates and corresponds to a "Y." Lateral nasal cartilage and the cartilaginous nasal septum form an intimate end-to-end relationship. The caudal two-thirds of the lateral cartilage is separated from the cartilaginous septum by a narrow cleft containing connective tissue, while the cephalic one-third of the lateral cartilage is continuous with the cartilaginous septum.

The use of free grafts or contiguous flaps as described by Lewin [66] is indicated in selected cases of nasal defects. The limitations of the free composite auricular graft are mainly the size of the defect and the condition of the surrounding tissues. The contiguous skin flaps from the cheeks and forehead may be used for repair of much larger defects. An incision parallel to the retracted nostril (Kazanjian) is made, and the skin in the nasal wall is undermined until nasal bone is reached. The deep layer of the nasal wall with the mucosa is then severed from the piriform aperture. The mobilized nose is brought downward to correct the retraction. The skin layer and the mucosal layer are then basted together, and the superficial defect above the nostril is covered with a skin graft (Fig. 3).

63. Fomon, S.; Bell, J. W.; Berger, E. L.; Goldman, I. B.; Neivert, H., and Schattner, A.: New Approach to Ventral Deflections of the Nasal Septum, A. M. A. Arch. Otolaryng. **54**:356 (Oct.) 1951.

64. May, H.: The Réthi Incision in Rhinoplasty, Plast. & Reconstruct. Surg. **8**:123 (Aug.) 1951.

65. Straatsma, B. R., and Straatsma, C. R.: The Anatomical Relationship of the Lateral Nasal Cartilage to the Nasal Bone and the Cartilaginous Nasal Septum, Plast. & Reconstruct. Surg. **8**:443 (Dec.) 1951.

66. Lewin, M. L.: Subtotal Rhinoplasty with Free Grafts and Contiguous Flaps, A. M. A. Arch. Otolaryng **54**:675 (Dec.) 1951.

In an original technic used in 51 cases of deformity of the nasal dorsum through loss of substance, repair was effected by Farina [67] with an autogenous osteoperiosteal graft taken from the crest of the tibia. The percentage of poor results in those patients suffering from leprosy was 9.85%.

In an ingenious method to repair small nasal tip losses, as reported by Cronin,[68] a caterpillar flap is raised with its base in the direction in which the flap is to be moved. When the distal end of the flap, which has been slid toward the base, has become well implanted, the original base of the flap is cut loose and the end advanced by using the fold in the flap for developing the tip of the nose.

Fig. 3.—(*a*) Flap from nasolabial fold used for resurfacing of the upper lip and base of ala; (*b*) flap lined with full-thickness graft, used for construction of nostril.

In a clever procedure to correct cicatricial nasal retraction after leishmaniasis in three stages, Cardosa [69] everts a wide midline triangular forehead flap to replace scar tissue and mucous membrane. Postoperative illustrations show satisfactory results. This method could be applied to some type of deformities due to syphilis.

A method is presented by Tamerin [70] in which a large nasal fistula is reconstructed by replacement of the mucous membrane by a pedicled skin graft. The

67. Farina, R.: Deformity of Nasal Dorsum Through Loss of Substance: Correction by Bone Grafting, Plast. & Reconstruct. Surg. **8**:320 (Oct.) 1951.

68. Cronin, T. D.: A New Method of Nasal Tip Reconstruction Utilising a Local Caterpillar Flap, Brit. J. Plast. Surg. **4**:180 (Oct.) 1951.

69. Cardosa, D.: Reconstruction of Cicatricial Nasal Retraction After Leishmaniosis, Plast. & Reconstruct. Surg. **7**:309 (April) 1951.

70. Tamerin, J. A.: A Method for the Reconstruction of a Large Nasal Fistula, Plast. & Reconstruct. Surg. **7**:157 (Feb.) 1951.

external skin covering is temporarily provided by a free skin graft, which is discarded by serial excision and replaced by adjacent skin.

Beinfield [71] describes an operation in which the nasal mucous membrane in front of the atresia and the posterior pharyngeal membrane are used to cover completely the raw bony surface of the newly created natural opening to prevent secondary closure. The operation is recommended for the older child and the adult but not for the newborn. Atresia in the newborn is possible, especially in cases of asphyxia neonatorum. Beinfield suggests that a more careful examination of the nares be made in all cases of persistent nasal obstruction in which all other causes have been eliminated. For congenital occlusion in the newborn Franck [72] recommends a choice between (1) puncture of the membrane with a trocar, allowing of the postponement of further measures until a child reaches adult age, and (2) extensive radical operation. He reports on a method involving destruction of the membrane with a curette through the nose, followed by avulsion of the posterior part of the vomer by the nasopharyngeal route with Chatellier's forceps and dilatation with gum-elastic bougies. Franck prefers the palatine route in adults.

A nasoform splint, a predecessor of which was one designed by Barnes and modified by Straith, is described by DeKleine.[73] A paddled steel-aluminum splint is secured in position by a tape and buckle. The author thinks this splint could be adapted to commercial production.

Mayer and Swanker [74] divide nasal hemorrhage into three types: (1) primary, occurring at the time of surgery; (2) secondary, from 24 to 48 hours postoperatively, usually controlled by anterior packing, and (3) delayed, which breaks out after packing has been removed. The blood supply to the nose is reviewed. The authors use iodoform gauze for nasal packing, with two strings brought out through the nose and tied over an anterior packing and one posteriorly is attached to the cheek with adhesive tape. Stevens [75] considers his rubber pneumatic pack efficacious for spontaneous or postoperative hemorrhage. He thinks that the pressure is evener in this improved model of his type of pack, first described in 1936.

Koechlin,[76] of the University of Geneva, introduces a small hand drill that can be threaded through a No. 14 injection needle. This is slipped beneath the periosteum at the root of the nose and is used to thin the bone on either side and particularly at the nasal bridge. The author believes that this drill allows much thinner saws to be used and eliminates use of the chisel under local anesthesia.

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71. Beinfield, H. H.: Treatment of Complete Unilateral Bony Atresia of the Posterior Nares: A New Technique and a Brief Reference to Asphyxia Neonatorum, A. M. A. Arch. Otolaryng. **53**:530 (May) 1951.

72. Franck, E.: Present-Day Ideas on Congenital Occlusion of the Choanae, Rev. laryng. **71**:389 (Sept. Oct.) 1950; abstracted, Excerpta Med. XI **4**:600, 1951.

73. DeKleine, E. H.: Nasoform Splint: An External Nasal Splint for General Use, A. M. A. Arch. Otolaryng. **54**:422 (Oct.) 1951.

74. Mayer, D. Mc.C., and Swanker, W. A.: Postoperative Nasal Bleeding, A. M. A. Arch. Otolaryng. **54**:384 (Oct.) 1951.

75. Stevens, R. W.: Nasal Packing: The Rubber Pneumatic Pack, A. M. A. Arch. Otolaryng. **54**:191 (Aug.) 1951.

76. Koechlin, H.: New Instruments in Rhinoplasty, Plast. & Reconstruct. Surg. **8**:132 (Aug.) 1951.

As reported by Link,[77] a new synthetic material called Supramid, similar to nylon, may be implanted in the cartilaginous framework of the nose without any subsequent reaction from the tissues.

Cottle and his colleagues [78] explored the use of hyaluronidase in rhinoplasty. There is less bleeding than when the spreading factor is not used. The postoperative edema and ecchymoses appear to be less frequent; the duration of the postoperative sequelae is diminished.

JAW

In a history of bone grafting for restoration of defects of the mandible, Ivy [79] designates the experience of World War I and the few years following as definitely establishing the crest of the ilium as the best source of bone for filling the majority of mandibular defects. The advent of the antibiotics has greatly minimized the hazards of this type of restoration. Furthermore, the use of cancellated bone chips has been a distinct advance. The application of preserved homogenous bone grafts is still in the experimental stage. For the present it is considered safer to place reliance on autogenous bone for repair of large losses in the continuity of the mandible.

In a case in which ameloblastoma had necessitated hemiremoval of the mandible, Kleitsch [80] reconstructed the condyle with the formation of an artificial temporomandibular joint, a procedure never described before. The Vitallium prosthesis was functioning well one year postoperatively. Conley [81] disapproves of a Vitallium prosthesis and implant as a substitute when bone grafting is warranted. Such artificial means may serve instead of the bone graft, with the hope of performing a bone grafting operation at a later date. Vitallium prostheses and implants should not be used when it is impossible to cover them generously with skin and mucous membrane unless there is extensive loss of tissue resulting from an injury and repair of this deficiency with appropriate flaps is anticipated.

In an informative general article, Pickrell and his colleagues [82] point out that the reconstructed temporomandibular joints in ankylosis of the jaw should be in a functional position and distal occlusion should be restored and maintained. The operation presented by the authors is a modification of the Risdon operation; the level of the insertion being higher (with the center at the angle of the mandible). They suture these interpolated masseter muscle flaps to the internal pterygoid muscle through a space created by osteotomy.

77. Link, R.: Plastic Surgery of the Cartilaginous Framework of the Nose, Ztschr. Laryng. Rhin. Otol. **30**:84 (Feb.) 1951.

78. Cottle, M. H.; Weiss, J. A.; Pottorff, E., and Herzon, E.: Hyaluronidase in Rhinoplasty, A. M. A. Arch. Otolaryng. **52**:369 (Sept.) 1950.

79. Ivy, R. H.: Bone Grafting for Restoration of Defects of the Mandible, Plast. & Reconstruct. Surg. **7**:333 (April) 1951.

80. Kleitsch, W. P.: Vitallium Reconstruction of a Hemimandible and Temporo-Mandibular Joint, Plast. & Reconstruct. Surg. **7**:244 (March) 1951.

81. Conley, J. J.: The Use of Vitallium Prostheses and Implants in the Reconstruction of the Mandibular Arch, Plast. & Reconstruct. Surg. **8**:150 (Aug.) 1951.

82. Pickrell, K. L.; Wilde, N. J.; Edwards, B. F.; Broadbent, T. R., and Georgiade, N.: The Correction of Ankylosis of the Jaw and Associated Deformities of the Face, Ann. Surg. **134**:55 (July) 1951.

In the case of an 8-year-old girl whose ankylosis of the temporomandibular joint was noticed at the age of 2 years, McManis and Dehne [83] felt that the growth center had already been damaged and that its preservation was of questionable value. After resection of the mandibular condyle the postoperative course indicated that restoration of normal function decreased the deformity and stimulated the eruption of a retarded tooth. In the opinion of Longacre and Gilby,[84] if both condyles are removed at one operation and the teeth are not wired the pull of the masseter will result in retrusion and in an open bite. They have interspersed cartilage in three patients and used continuous traction through a Kirschner wire in the mandible in one case of bilateral and two cases of unilateral ankylosis. In a follow-up of 1 year, 11 months, and 8 months, no roentgenographic evidence of narrowing of the pseudoarthrosis was observed. In treating ankylosis Plaza [85] uses Payr's incision and, following Putti's procedure, performs a large transverse resection of the coronoid and condyle, as necessary. A Kirschner wire and stirrup are used for permanent postoperative traction in the mental region for 10 days. Permanence of this traction during the first 48 hours is stressed.

Nonoperative methods by internal or external splinting in recurrent dislocation of the temporomandibular joint have not met with success in Gordon's [86] hands. In the operation proposed by him a new external lateral ligament is made from fascia lata (Fig. 4). The results to date are excellent, and only one complication has been encountered—one ligament was too short.

Dingman and Moorman [87] describe their method, meniscectomy, for the treatment of lesions of the temporomandibular joint. They believe that meniscectomy is indicated in the following types of cases: (1) recurrent dislocation of the meniscus, (2) fracture or tear of the meniscus, (3) blocking of the condyle, (4) partial erosion of the meniscus in traumatic arthritis, (5) noise and cracking symptoms due to other causes, and (6) severe persistent chronic progressive pain. The authors report a series of 12 successful operations of excision of the meniscus.

Condylar hyperplasia is taken by Gottlieb [88] to mean a progressing unilateral or bilateral hyperplasia of the mandibular condyle, of unknown origin, causing facial deformity and typical malocclusion. In his opinion, condylectomy is the most rational procedure and is employed if the condition is interpreted as being an independent, progressing growth of the condyle and in patients with severe pain.

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83. McManis, T. F., and Dehne, E.: Infantile Ankylosis of the Temporomandibular Joint: Treatment by Resection of the Mandibular Condyle, J. Bone & Joint Surg. **33-A**:505 (April) 1951.

84. Longacre, J. J., and Gilby, Ray F.: The Use of Autogenous Cartilage Graft in Arthroplasty for True Ankylosis of Temporo-Mandibular Joint, Plast. & Reconstruct. Surg. **7**:271 (April) 1951.

85. Plaza, F.: Treatment of Temporomandibular Ankylosis, Bol. Acad. peruana cir. **5**:211, 1951.

86. Gordon, S.: Recurring Dislocation of the Temporo-Mandibular Joint, Brit. J. Plast. Surg. **3**:244 (Jan.) 1951.

87. Dingman, R. O., and Moorman, W. C.: Meniscectomy in the Treatment of Lesions of the Temporomandibular Joint, J. Oral Surg. **9**:214 (July) 1951.

88. Gottlieb, O.: Hyperplasia of the Mandibular Condyle, J. Oral Surg. **9**:118 (April) 1951.

In a well-written article González-Ulloa [89] describes an operation for prognathic mandibles in which the elongation of the condyle process is observed. It is not for the acromegalic types, in which the mandible is generally hypertrophied. A roentgenographic study must be made to determine the portion of the condyle to be resected. The condition of the first molars must be evaluated. Masticatory function was found to be renewed within 24 hours after operation.

In three cases Clarkson and his colleagues [90] employed a combined Kostecka operation (a "blind" bilateral osteotomy of the ascending rami of the mandible) and nasal reduction (Tamarin's technic), including the tip, columella, and ala. The

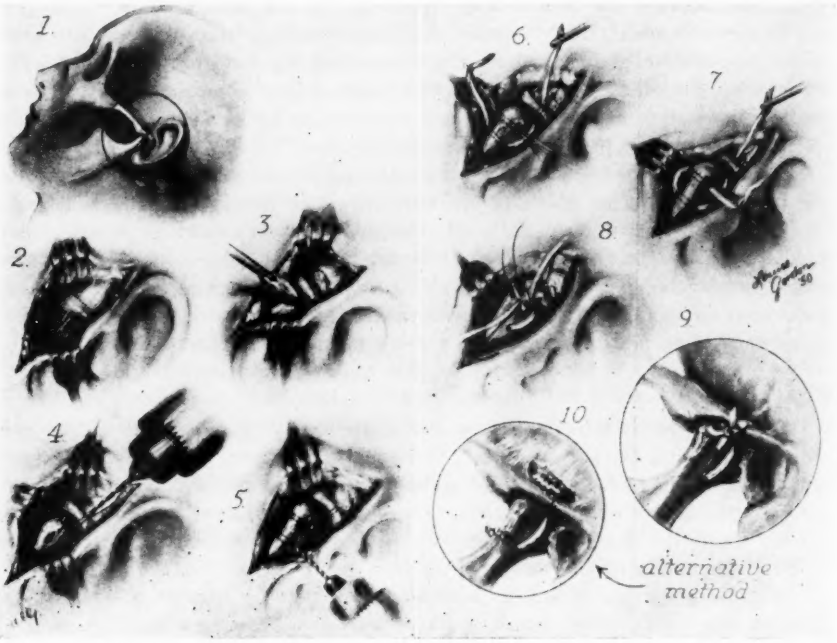

Fig. 4.—Repair of temporomandibular joint. (Reproduced with permission from the *British Journal of Plastic Surgery.*)

result as evaluated by the authors showed a considerable improvement in the dental articulation, as well as marked improvement in the facial appearance.

In five cases reported by Caffey [91] as occurring in members of two families, massive fibrous swelling of the cheeks and jaws began during the first three years of life, associated with defective dentition. The lower jaw may become so large

89. González-Ulloa, M.: Temporomandibular Arthroplasty in the Treatment of Prognathism, Plast. & Reconstruct. Surg. **8**:136 (Aug.) 1951.

90. Clarkson, P.; Grossman, W., and Walker, F. A.: Combined Reduction of the Lower Jaw and Nose, Brit. M. J. **2**:26 (July 7) 1951; abstracted, Abstr. World Surg. **10**:313 (Dec.) 1951.

91. Caffey, J., and Williams, J. H.: Familial Fibrous Swelling of the Jaws, Radiology **56**:1 (Jan.) 1951; abstracted, Surg., Gynec. & Obst. **93**:21 (July) 1951.

that it prevents closure of the mouth and interferes with respiration and speech. Roentgenologically external multilocular rarefaction and marked expansion of the mandible, with a similar condition in the maxilla, are observed. With the years the progress is decreased. The disease is to be distinguished from fibrous hyperplasia.

In a case of marked retrusion of the mandible, irregular upper teeth, narrow maxillary arch, high palatal arch, and protruding premaxilla, Kazanjian [92] performed a bilateral ostectomy of the mandible anteriorly to the molars and raised the jaw to occlude with the upper teeth. The excessive protrusion of the anterior region of the maxilla was reduced by extraction of the anterior teeth plus excision of a certain amount of alveolar bone, thus enabling the patient to wear an artificial denture to improve the facial outline.

In a case in which the left maxilla and three-fourths of the right one had been amputated, including the nasal floor and almost all the hard palate, von Deilen [93] made a left Kocher incision and grafted the raw surfaces immediately. Appliances and dentures were in place in less than two weeks. The author shows how split grafting immediately prevented scar contracture.

After removal of the condyle in the Macacus rhesus monkey Sarnat [94] found the mandibular function not to be seriously impaired. Roentgenographic and gross study revealed a false functional joint. The condyle is an important growth center of the mandible. In the human being, Sarnat states, the consequences of injury to this area may be even more extensive than in the experimental animal. It is for these reasons that operative intervention in this area in children should be undertaken only after consideration of its possible effects on the mandibular growth.

HARELIP AND CLEFT PALATE

In a comprehensive review of the management of wide unilateral cleft lip with nostril deformity, Davis [95] includes a history of the subject, giving credit to those who have made real contributions to advancement in this field. He is of the opinion that the problem of selecting one design rather than another is difficult. In his hands the operation designed by LeMesurier has stood the test of time since it was adopted, in 1946.

Regarding the age at which cleft palate and cleft lip should be operated on, there is still considerable discussion. According to Cannon and Fisher,[96] most of the surgeons in New England perform operation on the cleft palate when the patient is between the ages of 18 and 24 months. The authors use the Dieffenbach-Warren operation for this condition. They discuss various valuable improvements in the basic procedure. Prioleau [97] feels that early repair of the palate interferes

92. Kazanjian, V. H.: Congenital Deformity of the Maxilla and Mandible, Plast. & Reconstruct. Surg. **7**:396 (May) 1951.

93. von Deilen, A. W.: Bilateral Maxillary Amputation with Immediate Skin Grafting and Early Insertion of Appliances, Plast. & Reconstruct. Surg. **7**:533 (June) 1951.

94. Sarnat, B. G., and Engel, M. B.: A Serial Study of Mandibular Growth After Removal of the Condyle in the Macaca Rhesus Monkey, Plast. & Reconstruct. Surg. **7**:364 (May) 1951.

95. Davis, A. D.: Management of the Wide Unilateral Cleft Lip with Nostril Deformity, Plast. & Reconstruct. Surg. **8**:249 (Sept.) 1951.

96. Cannon, B., and Fisher, D.: Plastic Surgery: Harelip and Cleft Palate, New England J. Med. **245**:215 (Aug. 9) 1951.

97. Prioleau, W. H.: Management of Unilateral Cleft of the Palate, South. Med. & Surg. **112**:403 (Dec.) 1950.

with normal development. He thinks that the cleft of the hard palate may be partially closed in infancy by suturing a mucoperiosteal flap from the vomer to the edge of the palatal bone. The major palate repairs, in his opinion, should be postponed until the end of the fifth year.

Brückl,[98] who has observed a large number of cases of severe prognathia following harelip and cleft palate operations, believes that this condition is due to lack of proper development of the upper maxilla. In patients not operated on maxillary deformities are mostly observed in complete double clefts, where the influence of the muscular forces upon the growing maxilla is disturbed by the interruption of the orbicular ring (in 10% of the cleft palate cases). The lip operation should always be done after the fourth month as advocated by Rosenthal), while the repair of the soft palate is delayed until the fourth year of age. The hard palate is not closed before the sixth year. One must count on an important growth of the maxilla after the change in the front teeth. This growth can be strongly altered by postoperative scar contractures. The scar retraction produces an improper relation of the incisors, which is corrected by a removable plate with an inclined plane, bringing the upper incisors in front of the lower. In cases of severe prognathia following cleft palate operations a plate provided with a movable piece with a push screw (Schwartz) brings the receding process forward.

In Rosenthal's [99] opinion any method used in the surgical correction of congenital clefts will inevitably produce late deformities in the development of the maxillary bones. In the few cases observed by him in which the operation was delayed until after the 10th year of age, a lack of development of the maxilla was never found. Instead, there were a true procheilon and an enlargement of the maxillary arch. Among other corrective procedures for deformities due to early operations, bringing forward cheek tissues is preferred by Rosenthal whenever possible.

In another article, Davis [100] has presented an interesting report of an untreated bilateral complete cleft lip and palate in an adult. Despite the abnormal relationship of the tissues there has been no retardation of the normal processes of growth. While function is somewhat impaired owing to nonunion, the lips attempt to close off the mouth cavity and the lateral palate flaps move quite freely.

An excellent review of secondary deformities of the cleft palate was made by Kazanjian.[101] He assumes that the tenseness of the surgically repaired lip results in a greater pressure upon the dental arch than that exerted by a normal lip. It is possible to prevent this gradual maladjustment of the alveolar processes by the use of orthodontic appliances on the teeth at the proper time. Very little attention has been given to joining the ends of the maxillary processes by surgical procedures. If consolidation of the alveolar stumps is surgically possible, it may be found that the extent of malocclusion of the teeth will be lessened, and such a procedure

98. Brückl, H.: Orthopedic Treatment of Harelip and Cleft Palate, Chirurg **22**:169 (April) 1951.

99. Rosenthal, W.: Postoperative Maxillary Deformities After Harelip and Cleft Palate Operation, Chirurg **22**:483, 1951.

100. Davis, A. D.: Unoperated Bilateral Cleft Lip and Palate in the Adult: A Case Report and Comments, Plast. & Reconstruct. Surg. **7**:482 (June) 1951.

101. Kazanjian, V. H.: Secondary Deformities of Cleft Palates, Plast. & Reconstruct. Surg. **8**:477 (Nov.) 1951.

may also be a stimulant to bone growth and proper development of the maxilla. Evidence to support this theory, in the author's experience, lies in the fact that partial clefts, even when they extend as far anteriorly as the premaxilla and even though operated on by conventional procedures, do not usually result in a retarded growth of the maxilla.

Of the 35 cases in which the pharyngeal flap operation (Fig. 5) was done to improve speech, Moran [102] reports an excellent result in 8, a good result in 15, and fair result or improvement in 9. The patient must be willing to follow speech training diligently in order to obtain satisfactory results. In young persons in whom there is associated with the condition a large amount of adenoid tissue, it is better to base the pedicle of the flap above rather than below, and in persons in whom

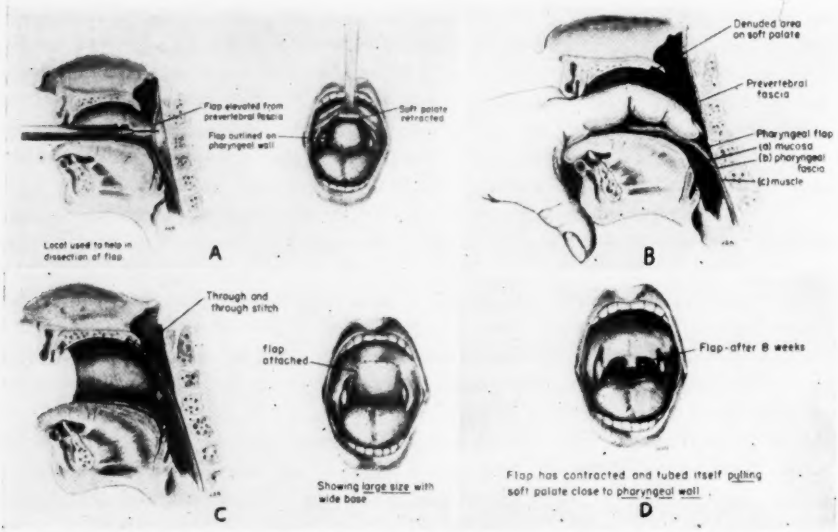

Fig. 5.—Pharyngeal flap operation. (Reproduced with permission from *Plastic and Reconstructive Surgery.*)

the distance from the free edge of the palate to the pharyngeal wall is more than 2 cm. the same procedure is advisable. The flap usually aids in providing an adequate palatopharyngeal sphincter. Moran does not believe that it is necessary to combine the pharyngeal flap operation with a push-back operation. Dunn [103] believes that the pharyngeal flap operation described by Moran is the most important surgical contribution thus far made in aiding speech in those cleft palate patients who have had their palates closed and still do not speak well. The operation makes it possible for these patients to close their oronasal opening. Conway,[104]

102. Moran, R. E.: The Pharyngeal Flap Operation as a Speech Aid, Plast. & Reconstruct. Surg. **7**:202 (March) 1951.

103. Dunn, F. S.: Observations on the Pharyngeal Flap Operation for the Improvement of Speech in Cleft Palate Patients, Plast. & Reconstruct. Surg. **7**:530 (June) 1951.

104. Conway, H.: Combined Use of the Rush Back and Pharyngeal Flap Procedures in the Management of Complicated Cases of Cleft Palate, Plast. & Reconstruct. Surg. **7**:214 (March) 1951.

however, holds that the combined use of the push-back and pharyngeal flap procedure is especially indicated in the management of cases in which there is a persistently open cleft of the velum or loss of tissue of the velum. He prefers to have the base of the pedicle turned downward.

Cooper [105] has written an article on the dentist's opportunity in the care of the cleft palate patient. He bases his views on his experience as the director of the Lancaster Cleft Palate Clinic, Lancaster, Pa., where some 1,500 patients have been examined and treated. The author makes a plea for better understanding of the secondary functions of the teeth by the dentists, so that when "speech centres are established dentistry will be included in the program." Case reports of (1) a loss of premaxilla and (2) short palates are given, both of which were corrected by dental appliances.

It is the opinion of Conroy [106] that orthodontic treatment should be undertaken at whatever age the growth and denture positions indicate that improvement can be hoped for and the cooperation of the child can be secured.

In Harkins' [107] opinion, surgery is the only method of treatment for repairing the lip, nose, and alveolar ridge in patients with unilateral or bilateral cleft palates. It can be considered as a method of palatal treatment for complete and incomplete clefts when there is ample remaining tissue to assure a satisfactory functional closure as the oral cavity grows and develops. A prosthesis, instead of surgery, should be accepted as a method of treatment for clefts with insufficient tissue after surgery has been attempted and failed. Only within recent years, as pointed out by Fredrickson,[108] have we realized the advantages of combining reparative surgery and a maxilloprosthesis for repair of facial defects and deformities. The author concludes that no matter how skilful the plan is in repair of the lip, unless adequate support is supplied from within the mouth desirable results in the contour of the lip and cheeks cannot be obtained.

A method for repair of postalveolar cleft palate utilizing three flaps is described by Cuthbert.[109] The procedure is an attempt to obtain maximal posterior displacement of the soft palate. This operation has been done on only a limited number of patients, and speech results are as yet unknown.

The nerve supply of the soft palate was studied by Broomhead.[110] The studies reveal that during operative repair of the cleft palate damage may be inflicted on the nerve to the tensor palati muscle. It was found to be a small branch of the trigeminal nerve given off by the branch supplying the internal pterygoid muscle. Anesthesia of the soft palate results from section of the lesser palatine nerves, and paralysis of the musculus uvulae also occurs.

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105. Cooper, H. K.: Cleft Palate: Dentistry's Opportunity, J. Am. Dent. A. **42**:37 (Jan.) 1951.

106. Conroy, C. R.: Three Age Phases of Orthodontic Treatment of the Cleft Palate Child, Plast. & Reconstruct. Surg. **7**:100 (Feb.) 1951.

107. Harkins, C. S.: Surgery and Prosthesis in the Rehabilitation of Cleft Palate Patients, Plast. & Reconstruct. Surg. **7**:32 (Jan.) 1951.

108. Fredrickson, E. J.: Correction of Cleft Palates by Dental Appliances, Northwest. Med. **50**:268 (April) 1951.

109. Cuthbert, J.: Transposed Flaps in Palate Repair, Brit. J. Plast. Surg. **4**:185 (Oct.) 1951.

110. Broomhead, I. W.: The Nerve Supply of the Muscles of the Soft Palate, Brit. J. Plast. Surg. **4**:1 (April) 1951.

ORAL CAVITY

As recommended by Edgerton,[111] large surgical defects in the oral mucosa are replaced with some lining tissue as soon as possible. He uses local cervical skin and split grafts as the most accessible donor sites for living tissue. In all patients in whom eventual bone grafting is thought to be likely, a full thickness pedicled flap is employed. A suitable first-stage operation, which may be done with the area under local anesthesia, is followed 10 days later by the resection of the intraoral cancer in continuity with the neck lymphatics, at which time this replacement is effected.

THROAT AND ESOPHAGUS

As reported by Longacre,[112] in a 3-month-old child with congenital atresia of the fauces, the soft palate being held down firmly across the base of the tongue, the only opening into the oropharynx was a partial cleft of the soft palate. The author believes that such an atresia is due to persistence of the oral buccopharyngeal membrane. He describes the steps of the operative procedure to obtain relaxation and also the mobilization of flaps providing for coverage. The palate was repaired in order to obtain better levator action (Fig. 6).

Lewis [113] reports an interesting case of an infected tracheotomy in infancy that had resulted in a "shot-gun" aperture in front of the neck in a young man. Previous operations had opened up the upper stenosed communication with the larynx. The lining was provided by turning up a U-shaped flap from over the sternum. This flap was delayed and then carried up with an oblong section of the cortex of the sternum to replace the stiffening of the tracheal rings.

Attention is directed to plastic work on the esophagus. The advantages and disadvantages of the previously described methods for correcting congenital esophageal atresia are discussed by Ross and his colleagues.[114] The authors describe one case in which the upper segment of the esophagus was mobilized through an incision in the neck and the distal end was brought out lateral to the origin of the sternocleidomastoid muscle on the left side. The lower segment was drawn into the abdominal cavity and carried up over the costal margin, its free end being sutured at the level of the sixth rib. Later a skin-lined tube of skin was used to connect these two ends.

In a case of resected cervical esophagus presented by Baronofsky,[115] fascia lata was sewn around a cylinder of tantalum mesh in such a manner that the mesh was completely covered on the outside and ends. The patient died, and at autopsy the fascia lata transplant was found to be completely epithelized with normal squamous epithelium.

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111. Edgerton, M. T.: Replacement of Lining to Oral Cavity Following Surgery, Cancer **4**:110 (Jan.) 1951.

112. Longacre, J. J.: Congenital Atresia of the Oropharynx, Plast. & Reconstruct. Surg. **8**:341 (Nov.) 1951.

113. Lewis, E.: Repair of the Cervical Trachea and Larynx, Lancet **1**:830 (April 14) 1951.

114. Ross, D. E.; Baxter, H., and McHugh, H. E.: Œsophago-Dermato-Œsophagoplasty for Congenital Œsophageal Atresia, Canad. M. A. J. **64**:128 (Feb.) 1951.

115. Baronofsky, L. D., and Hilger, J.: Fascia Lata Transplants for Resected Cervical Esophagus, Surgery **30**:355 (Aug.) 1951.

A method for reconstruction of the pharynx and cervical esophagus is presented by Klopp, Alford, and Pierpont.[116] Long, tedious, and expensive procedures have been necessary, and surgical therapy which can be curative has not been employed often in treatment of cancer of the pharynx and cervical esophagus. In their

Fig. 6.—Repair of the palate has been performed in order to obtain better levator action. Buccal mucosa flaps have been advanced and anchored in place over the exposed palatoglossus muscle to prevent recurrence of atresia. (Reproduced with permission from *Plastic and Reconstructive Surgery.*)

116. Klopp, C. T.; Alford, C., and Pierpont, H.: The Use of Polyethylene Film and Split-Thickness Skin Graft in Reconstruction of Cervical, Esophageal, and Pharyngeal Defects, Surgery **28**:231 (Feb.) 1951.

experimental studies on dogs, the authors found it possible to reconstruct the cervical esophagus in one stage at the time of excision, by using polyethylene film and a split-thickness skin graft.

FACIAL PARALYSIS

In Owens' [117] review the different surgical procedures in the treatment of facial paralysis are well evaluated. When it is felt that a complete destruction exists and the use of a nerve graft or a nerve transplant is inadvisable, one has to weigh repair by the use of either transplanted strips of nonparalyzed muscle or strips of fascia

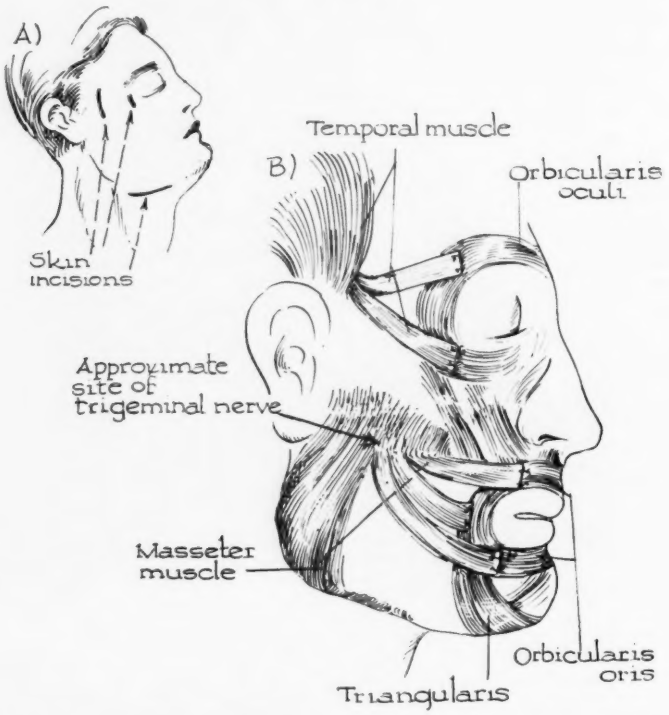

Fig. 7.—*A*, three sites of incisions made in order to permit formation and transfixion of three muscle bundles from anterior half of masseter muscle and two muscle bundles from anterior portion of temporal muscle. *B*, advancement and attachment of the three muscle bundles from the masseter muscle as they are attached to a portion of the paralyzed muscle of the upper lip, the muscle at the angle of the mouth, and the paralyzed muscle of the lower lip. Also illustrated is the method of attachment of the muscle bundles from the temporal muscle as they are transfixed to the muscle of the upper and lower eyelids. (Reproduced with permission from *Plastic and Reconstructive Surgery.*)

to attach the paralyzed muscle to the unparalyzed. Of the two latter methods, the one of choice would be repair by means of transplantation of three muscle strips from the anterior half of the masseter muscle. These strips would be carried for-

117. Owens, N.: Surgical Treatment of Facial Paralysis, Plast. & Reconstruct. Surg. **7**:61 (Jan.) 1951.

ward to be incorporated into the fibers of the orbicularis superior, the angle of the mouth, and the orbicularis inferior muscle (Fig. 7). Brunner [118] agrees that the use of a masseter muscle transplant is the method of choice. He does this procedure intraorally. It is his opinion that the corner of the mouth should be further supported. This is done also intraorally, by suspending the orbicularis oris by absorbable surgical (gut) sutures to the frontal process of the maxilla. The two procedures can be carried out at the same time.

Love and Cannon [119] surveyed 87 cases of unilateral facial paralysis in which spinofacial nerve anastomosis was performed at the Mayo Clinic from Jan. 1, 1926, to Jan. 1, 1949. The results of the follow-up of 61 patients who underwent the operative procedure reassured the authors that whenever possible the spinal accessory nerve should be employed to conduct impulses to the facial musculature in cases in which reestablishment of the continuity of the facial nerve cannot be effected.

SCARS

Every otolaryngologist finding vast satisfaction in the normal healing of wounds will be interested in studies by several British authors on the causes of abnormal healing. As viewed by Mowlem,[120] in the early stages scar hypertrophy and keloid are indistinguishable. The former passes into a state of regression and the latter either maintains or slowly increases its volume and extent for an indefinite period. Control of hypertrophy would seem capable of achievement by (1) desensitization to the local foreign body (if keratin is a factor, this approach is fraught with difficulties); and (2) reduction of activating factors, such as (*a*) removal of exogenous foreign material from dressings, and (*b*) excision of endogenous material in partial skin losses such as deep second degree burns.

Glücksmann [121] believes that scar keloids and scar hypertrophy are due not to an autonomous overgrowth of scar tissue but to fibrotic proliferation following an inflammatory process.

Radiation in properly administered dosages will prevent the development of hypertrophic scars. Levitt [122] is convinced that both preoperative and postoperative treatment give the best results. The recommended dosage is approximately 525 to 650 r. The dosage is calculated to give a "first degree" skin reaction, the only sequel of which is transient pigmentation, and this may not be constant. It would appear that the radiations tend to prevent hypertrophy by inhibiting early epidermal proliferation, thereby lessening the risk of forming endogenous foreign bodies, and by reducing the vascular supply and inflammatory cellular infiltration of the dermis. Treatment of recently developed hypertrophy is fairly satisfactory and that of established scars is unsatisfactory. Roentgen rays are used almost exclusively.

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118. Brunner, Hans: Treatment of Inveterate Facial Paralysis, Plast. & Reconstruct. Surg. **8**:390 (Nov.) 1951.

119. Love, J. G., and Cannon, B. W.: Nerve Anastomosis in the Treatment of Facial Paralysis: Special Consideration of the Etiologic Role of Total Removal of Tumors of the Acoustic Nerve, A. M. A. Arch. Surg. **62**:379 (March) 1951.

120. Mowlem, R.: Hypertrophic Scars, Brit. J. Plast. Surg. **4**:113 (July) 1951.

121. Glücksmann, A.: Local Factors in the Histogenesis of Hypertrophic Scars, Brit. J. Plast. Surg. **4**:88 (July) 1951.

122. Levitt, W. M.: Radiotherapy in the Prevention and Treatment of Hypertrophic Scars, Brit. J. Plast. Surg. **4**:104 (July) 1951.

In reference to vitamin E, Edgerton and his colleagues [123] found this agent in very high doses (1,200 mg. per day) was not effective in preventing gross development of keloids. Relief of subjective discomfort in keloids may very likely be obtained by the use of vitamin E.

An article on the physical basis of scar contracture by Ju [124] does not lend itself readily to abstracting, but, being of utmost interest, it should be read in its entirety to be understood and appreciated.

In one case of true keloid reported by Polson [125] the patient was treated with a total dose of 9.6 gm. of cortisone acetate. This drug did not have any effect either on the lesions that were already present or in preventing recurrence of new lesions.

FRACTURES

Walden [126] prefers not to use headcaps or splints in multiple fractures of facial bones. The nearest bony structure lying cephalad to the fracture site serves as a support. The use of teeth to aid in immobilization is mentioned by Walden. In a concise but elementary article, Greenwood [127] reports a case in which reduction of the mandible had to be delayed for 10 days because of oral and glossal edema. Nasal obstruction was so severe that it was necessary to do a submucous resection first. A plea is made by Dingman and Harding [128] for adequate early treament of deformities due to malunion of fractures of the bones of the face. Frontal bone deformities are corrected with cancellous bone as the material of choice. The deflected nose is corrected by nasal osteotomy; saddle nose, by iliac bone, the graft being held in place by direct wiring. Malunion of the zygomaticomaxillary compound can be managed by osteotomy and realignment of the fractures. In cases of fibrous malunion of the maxilla the handle of an impression tray in a new procedure is grasped and moved firmly from side to side and up and down in an attempt to rupture the fibrous tissue attachments of the fracture sites. The authors suggest multiple osteotomies followed by supportive grafts to correct "dish face."

Indirect evidence of depressed fractures of either the outer half or the inner half of the malar bone, as pointed out by Lintilhac,[129] may be anesthesia of the skin supplied by the intraorbital nerve, damage to the maxillary antrum, the presence of trismus, and changes in the orbital cavity. He has used a Kirschner wire with success. For a long-standing fracture of the inner half, approach through the antrum or the nasal vestibule is recommended.

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123. Edgerton, M. T.; Hanrahan, E. M., and Davis, W. B.: Use of Vitamin E in the Treatment of Keloids, Plast. & Reconstruct. Surg. **8**:224 (Sept.) 1951.

124. Ju, D. M.: The Physical Basis of Scar Contraction, Plast. & Reconstruct. Surg. **7**:343 (May) 1951.

125. Polson, J. S.; Pattee, C. J., and Woolhouse, F. M.: Keloid, Canad. M. A. J. **65**:447 (Nov.) 1951.

126. Walden, R. H.: Treatment of Multiple Fractures of Facial Bones, Plast. & Reconstruct. Surg. **8**:307 (Oct.) 1951.

127. Greenwood, G. J.: Facial Fractures: Case Presentation, Laryngoscope **61**:468 (May) 1951.

128. Dingman, R. O., and Harding, R. L.: Treatment of Malunion Fractures of Facial Bones, Plast. & Reconstruct. Surg. **7**:505 (June) 1951.

129. Lintilhac, J. P.: Traumatic Depression of the Malar Bone: Clinical Considerations and Practical Procedures for Its Reduction, Rev. laryng. **72**:538 (July-Aug.) 1951; abstracted, Abstr. World Surg. **10**:305 (Dec.) 1951.

In a recent malar fracture, González-Ulloa [130] employed the intraoral route, incising the mucosa in the gingivolabial sulcus and elevating the soft parts so as to reach the posterior aspect of the displaced malar bone. No fixation of fragments was required.

For open reduction of fractures of the mandibular condyle Henny [131] uses the Risdon approach through an incision at the angle of the mandible. The insertion of the external pterygoid muscle is detached from the interarticular fibrocartilage and the neck of the condyle. The author feels that this muscle detachment eliminates the possibility of postoperative displacement of the condyle by muscle traction.

The pathological anatomy and diagnosis of fractures of the zygoma are discussed by Tanzer.[132] After a historical review of treatment over the past 50 years, the importance of maintenance of position following reduction is emphasized and an effective plan of treatment outlined. A headcap based on the principle of balanced elastic support affords fixation of malar fractures and some nasal and maxillary ones.

Probably nasal fractures are the most frequently encountered. Miller [133] advises routine examination of the newborn for dislocation of the nasal septum. The signs and symptoms in order of frequency are epistaxis; swelling; ecchymosis (especially of the eyelids); tenderness over the site of the fracture; the almost invariable presence of a fractured or dislocated septum; positive roentgenograms; obvious bony or cartilaginous deformity, and crepitus, conclusively diagnostic; nasal obstruction, due to hematoma, and periorbital emphysema, due to air in subcutaneous tissue.

If there is an escape of cerebrospinal fluid, involving the cribriform plate, the author advises delay in reduction for at least 10 days. If the nasal pyramid is driven into the skull, there should be a delay of six months; then a rhinoplasty should be performed. In soft tissue injury the compound fracture if seen within eight hours should be converted into a simple one. Linear fractures require no reduction. Greenstick fractures, usually at the junction of the nasal bones with the maxilla, are diagnosed by an exploratory reduction in the absence of epistaxis and must be completed. The nasal septum is fractured as a rule at the junction of the quadrilateral cartilage and the vomer. In a depressed nasal fracture with a saddle deformity the bones must be elevated and the septum restored to its normal position. In superficial fractures from below, the nasofrontal angle will be lost. If the fracture is deep, the nasofrontal angle will be increased, when the fragments should be pulled caudally with forceps.

The ideal time to reduce a nasal fracture is within 24 hours. Delay might be advisable because of swelling, but reduction should be carried out before two weeks has passed from the time of injury.

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130. González-Ulloa, M.: Intraoral Treatment of the Fractures of the Malar Compound, Prensa méd. argent. **38**:501 (March 2) 1951.

131. Henny, F. A.: A Technic for Open Reduction of Fractures of the Mandibular Condyle, J. Oral Surg. **9**:233 (July) 1951.

132. Tanzer, R. C.: Fracture of the Zygoma, Plast. & Reconstruct. Surg. **7**:400 (May) 1951.

133. Miller, M. S.: Diagnosis and Treatment of Recent and Neglected Nasal Fractures, Canad. M. A. J. **65**:348 (Oct.) 1951.

NEW GROWTHS

In cavernous hemangiomas Jermiah [134] prefers enucleation with preservation of epithelium, especially on the nose and lips. Recurrence is due to difficulty in ascertaining whether the removal of diseased tissue has been complete. In total removal of tumor on the lips it may be necessary to close the defect as in harelip.

Bony hypertrophies occurring in the course of cutaneous angiomas of the face are rare. Six cases observed by Cernéa and co-workers [135] are reported, one of which is given in detail. The vascular alterations are not the determining factors in hemihypertrophies of the face and body. The hypertrophies, which may involve the soft parts, are thought to be due to hypophyseal disturbances.

Caldwell,[136] Conway,[137] and Karabin [138] report on hemangiomas of the parotid gland. In a 3-year-old child an increasing right-sided facial swelling at removal was found by Caldwell to be nonencapsulated and infiltrating between the parotid lobes and branches of the facial nerve. The presence of the parotid ducts and occasional acini in most of the lobules and inward encroachment of the tumor from without gave evidence of its origin within the gland. In Conway's case an infant with a large rapidly growing cavernous hemangioma was treated by roentgen irradiation at operative exposure, with a good result. At the time of surgery it was impossible to dissect the finer branches of the facial nerve. Karabin, who reported on the case of a 15-year-old patient, treats these lesions by total extirpation of the parotid gland, including the lobes, with preservation of the facial nerve. The lesion is usually unilateral.

As stated by Sawyer and Woodruff,[139] hygromas are benign multilocular cystic tumors of lymphatic origin with a lining of endothelium. The neck is the commonest site of the lesion; a soft, multilocular cystic tumor, which is often adherent to the skin, may penetrate deep into the neck and extend into the mediastinum, occasionally to the axilla. The authors mention several methods of treatment. In their series of cases all hygromas were excised surgically; excision must be complete. The importance of early removal is stressed.

Grabske [140] discusses the embryological development along the lines of embryonic fusion of the congenital inclusion type of dermoid cyst and presents one case. Such cysts are to be differentiated from thyroglossal-duct cysts, lipomas, hemangiomas, discrete tuberculous glands, and cancer of the larynx. A thymic cyst situated

134. Jermiah, B. S.: Cavernous Hemangiomas Which Failed to Respond to Various Forms of Treatment Other than Surgery, Plast, & Reconstruct. Surg. **7**:302 (April) 1951.

135. Cernéa; Aubert; Guérin, and Marie, M.: Bony Hypertrophies in the Course of Cutaneous Angiomas of the Face, Semaine hôp. Paris **27**:1467 (May 6) 1951; abstracted, Surg., Gynec. & Obst. **93**:424 (Nov.) 1951.

136. Caldwell, R. A.: A Case of Congenital Capillary Haemangioma of the Parotid Gland, Brit. J. Surg. **39**:261 (Nov.) 1951.

137. Conway, H.: Cavernous Hemangioma of the Parotid Gland Treated by X-Radiation at the Time of Operation, Plast. & Reconstruct. Surg. **8**:237 (Sept.) 1951.

138. Karabin, J. E.: Cavernous Hemangioma of the Parotid Gland: Report of a Case, Surgery **30**:367 (Aug.) 1951.

139. Sawyer, K. C., and Woodruff, R.: Cystic Hygromas of the Neck, A. M. A. Arch. Surg. **63**:83 (July) 1951.

140. Grabske, C. F.: Dermoid Cyst of the Midline of the Neck, A. M. A. Arch. Otolaryng. **54**:183 (Aug.) 1951.

unilaterally in the neck of a 4½-year-old girl is described by Weller and co-workers.[141] The lesion seems to be extremely rare but should be considered in the differential diagnosis of cystic lesions of the neck.

To facilitate the procedure of coring-out a thyroglossal cyst within a 3 mm. radius, Fallon[142] introduces a corer (a revolving tubular knife) guided by the elongated, enlarged handle of a skewer, and passes it from the midpoint of the hyoid bone to the foramen cecum (Sistruck) to immobilize the area.

In an interesting case of fibrous dysplasia of the maxilla involving the skull, facial bones and long bones, and the pelvis and lower extremities, reported by Hill,[143] repeated fractures occurred and healing was subsequently satisfactory. Grotesque overgrowth resulted in areas of facial fractures, and a tumor mass in the right maxilla was particularly disabling. It is demonstrated that the treatment of choice for fibrous dysplasia involving the maxilla is wide resection of the tumor mass plus postoperative roentgen-ray therapy.

Weaver[144] discusses the diagnosis and treatment of the various tumors of the face, such as nevi, keratoses and hyperkeratoses (which he treats as precancerous), xanthomas, chondromas, neurofibromas, lipomas, rhinophyma, and hemangiomas. Keloids are best treated by surgical removal, followed by roentgen-ray therapy as soon as the wound has healed. Osteitis fibrosa cystica and osteitis deformans affecting the bone of the face may indicate operative removal of excess bone for cosmetic purpose. Most cancers of the face do not recur after simple excision or electrocoagulation. Irradiation is most effective against tumors which have not been infected, which have not been treated previously, and which do not involve perichondrium or periosteum. The method or combination of methods that is most suitable for the particular characteristics in each case should be used.

Tumors of the jaw are classified by Ward and Hendrick[145] into two main primary types: (1) those arising from ectoderm and (2) those arising from mesoderm; the mixed tumor has both ectodermal and mesodermal elements. The occasional metastatic tumor is associated with carcinoma or sarcoma elsewhere in the body.

Barclay and his associates,[146] of the University of Minnesota Medical School, present an analysis of 221 patients with cancer of the head and neck. They believe that the surgeon and radiotherapist should cooperate closely in successful treatment, and they consider as an integral part extirpation of the lymph node-bearing areas of the neck by neck dissection. The latter appears to be indicated as a prophylactic

141. Weller, R. W.; Pearce, A. E., and Rapoport, M.: Thymic Cyst of the Neck, A. M. A. Arch. Path. **52**:569 (Dec.) 1951.

142. Fallon, J.: A Method of Resection for the Thyroglossal Duct, Surg., Gynec. & Obst. **93**:107 (July) 1951.

143. Hill, E. J.: Fibrous Dysplasia of the Maxilla, Plast. & Reconstruct. Surg. **8**:398 (Nov.) 1951.

144. Weaver, D. F.: Tumors of the Face, Arch. Otolaryng. **52**:234 (Aug.) 1950.

145. Ward, G. E., and Hendrick, J. W.: Tumors of the Jaws, J. Internat. Coll. Surgeons **15**:443 (April) 1951.

146. Barclay, T. H. C.; Peltier, L. F., and Kremen, A. J.: Neck Dissections in the Treatment of Cancers of the Head and Neck: An Analysis of 221 Patients, Ann. Surg. **134**:828 (Nov.) 1951.

measure for most patients with cancer of the oral cavity except the lip. Peltier and co-workers [147] found that 34 (17%) of 200 patients with malignant epithelial tumors on the head and neck had metastases below the clavicle, 28 of the 34 patients having cervical lymph node involvement. As viewed by Woolner and McDonald,[148] the risk of allowing any questionable lump to remain undiagnosed greatly outweighs the danger of dissemination. It is advisable to follow certain general rules in taking the biopsy specimen so that maximal information may be obtained from the procedure.

In a review of the data from previous studies of epithelioma of the lower lip treated at the Mayo Clinic, Pemberton [149] found more than 80% of the lesions were of low-grade malignancy and the average duration exceeded 21 months. The survival rates were directly related to the degree of differentiation of the cells as expressed according to Broder's method. Routine dissection of the submental and submaxillary nodes is done. Hendrick and Ward [150] perform routine suprahyoid dissection for Grade 2 and 3 lesions of the lip over 2 cm. in diameter, of short duration and of rapid growth, without palpable nodes. This procedure is also carried out for lesions of long duration and of any grade if they are more than 3 cm. in diameter, even in the absence of palpable nodes. These authors believe that tumors growing away from the surface are much more malignant than those growing toward the body. If the cancer is located on the lateral third of the lower lip, the mandible should be examined roentgenographically. In the absence of indications, prophylactic neck dissection is not done by Upchurch and Marzoni [151] in cases of cancer of lip. They believe that removal of the lesions that are nonmalignant but likely to become malignant will contribute to control of the cancer. Treatment is recommended for all lips showing thickened patches of leucoplakia, chronic scaling keratosis, persistent inflammatory ulcers, or recurrent fissures.

According to Kirklin, McDonald, Harrington, and New,[152] the controversy regarding proper therapy for parotid tumors stems from the difficulty in classifying the pathology of the neoplasms. Their classification is based on the histopathology. It is the authors' belief that fresh frozen sections at the time of operation are essential in order that the histopathologic nature of the tumor may be known and may thus guide definitive therapy. A patient with advanced primary malignant neoplasm of the mandible without evidence of metastasis was treated, as reported

147. Peltier, L. F.; Thomas, L. B.,; Barclay, T. H. C., and Kremen, A. J.: The Incidence of Distant Metastases Among Patients with Head and Neck Cancers: An Analysis of 200 Autopsies, Surgery **30**:827 (Nov.) 1951.

148. Woolner, L. B., and McDonald, J. R.: Biopsy in Cancer Diagnosis, S. Clin. North America **31**:947 (Aug.) 1951.

149. Pemberton, J. deJ.: Epithelioma of the Lower Lip, S. Clin. North America **30**:1141 (Aug.) 1950.

150. Hendrick, J. W., and Ward, G. E.: Treatment of Cancer of the Lip, J. Internat. Coll. Surgeons **15**:7 (Jan.) 1951.

151. Upchurch, S. E., and Marzoni, F. A.: Cancer of the Lip, J. M. A. Alabama **20**:366 (April) 1951.

152. Kirklin, J. W.; McDonald, J. R.; Harrington, S. W., and New, G. B.: Parotid Tumors: Histopathology, Clinical Behavior, and End Results, Surg., Gynec. & Obst. **92**:721 (June) 1951.

by Castigliano and Gross,[153] by intensive preoperative irradiation therapy followed by radical resection of the mandible by the oral route. Although many primary malignant neoplasms are not radiosensitive, the use of such intensive irradiation therapy, as viewed by the authors, may exert a highly desirable effect by decreasing the preoperative shower of emboli, by decreasing the incidence of tumor dissemination during the operative procedure, and by providing a period of observation for subclinical metastasis to become evident.

In a case reported by Kazanjian,[154] resection of a tumor of the mandible extended from the left temporomandibular area to the right last molar region. For reconstruction a chest skin flap was brought up in stages, and three large blocks of iliac bone were joined together and also to the remaining segment of the mandible by stainless steel wires. A pocket in the chin was lined with a split graft.

That carcinoma developing as a consequence of radiodermatitis is always prickle cell in type has become almost accepted as a fact, but this assumption is not invariably true, as stated by Anderson and Anderson.[155] Basal cell epitheliomas may also develop, as demonstrated by a few reports in the literature and by the authors' own cases. The distribution of the basal cell epitheliomas in their cases was considerably different from that of the lesions which arise spontaneously. Fibrosarcoma rarely develops in skin damaged by roentgen rays. Only one such case has come under the observation of Stewart and Pendergrast.[156] In almost all cases reported as instances of sarcomatous changes in irradiated tissues these changes are associated with chronic infection or prolonged repeated irradiation.

Basal cell carcinoma on an eyelid previously grafted for correction of scar contracture was treated by five surgical interventions, followed by application of autogenous skin grafts, as reported by Spaeth.[157] After a delayed return of the patient ulceration was found to have progressed beyond the graft into the orbit.

In 1924 Darier and Ferrand first described an unusual progressive and recurring tumor of fibromatous or fibrosarcomatous character. In this series of 39 cases of tumor at Memorial Hospital, New York, in a period of over 20 years, Pack and Tabah[158] found a uniform clinical history. All growths were attached to the skin, and the majority were confined to the dermis and epidermis. Dermatofibrosarcoma protuberans has been thought to be malignant because of its known tendency toward local recurrence after a presumably wide excision. A biopsy diagnosis is necessary for identification. The treatment of choice, according to Pack and Tobah, is radical surgical excision, extirpating beyond the fine projecting rami of the tumor and through normal tissue.

153. Castigliano, S. G., and Gross, P.: Immediate Prosthesis Following Radical Resection in Advanced Primary Malignant Neoplasm of the Mandible, J. Oral Surg. **9**:31 (Jan.) 1951.

154. Kazanjian, V. H.: Resection of Tumor of the Mandible and Repair of the Deformity: Report of a Case, J. Oral Surg. **9**:59 (Jan.) 1951.

155. Anderson, N. P., and Anderson, H. E.: Development of Basal Cell Epithelioma as a Consequence of Radiodermatitis, A. M. A. Arch. Dermat. & Syph. **63**:586 (May) 1951.

156. Stewart, C. B., and Pendergrast, W. J.: Fibrosarcoma Developing in Heavily Irradiated Skin, J. M. A. Georgia **40**:24 (Jan.) 1951.

157. Spaeth, E. B.: Replacement of Skin Graft by Basal Cell Carcinoma, J. Maine M. A. **42**:6 (Jan.) 1951.

158. Pack, G. T., and Tabah, E. J.: Dermatofibrosarcoma Protuberans: A Report of 39 Cases, A. M. A. Arch. Surg. **62**:391 (March) 1951.

MISCELLANEOUS

In his experimental studies on the behavior of autogenous human tissue grafts, Peer [159] made observations under conditions of contact with unlike tissues and with like tissues. This article is so comprehensive that it should be read in the original for full understanding. Some of the authors' conclusions suggest the detailed study that was necessary for this experimental work. The chart here included presents a summary graphically (Fig. 8).

The cells in cartilage, septal bone, fascia, tendon, and surface skin grafts tend to survive, the tissues retaining their specific structure. Rib and tibial and iliac bone grafts in contact with unlike tissues are replaced by host fibrous tissue; in contact with bone they tend to retain their calcified structure; 50% of the fat cells in fat grafts surviving transplantation, with their connective-tissue framework, comprise the bulk of the fat graft which remains one year or more following transplantation. Fat grafts have the same fate whether transplanted in contact with fat or with unlike tissue. The muscle cells or fibers in free muscle grafts in contact with unlike tissue or muscle always degenerate and disappear after free transplantation. The epidermis, hair follicles, and glands tend to degenerate and disappear in buried skin grafts. Nerve grafts transplanted in contact with unlike tissues show survival of the fibroblast cells in the neurium and proliferate, replacing the degenerating axons and myelin sheaths. In nerve grafts in accurate contact with nerve, the Schwann cells survive but the axons and myelin sheaths degenerate and disappear.

Dead grafts in contact with unlike tissues show replacement by fibrous tissue or mixed connective tissue derivatives. In contact with like tissue they also show replacement by connective tissue, except bone in contact with bone and nerve in accurate contact with nerve, which tend to be replaced by the same type of tissue.

The vascular system in free grafts tends to survive transplantation. The early circulating blood for these surviving blood vessels of the graft is provided through direct anastomosis of host and graft blood vessels.

A cell survival theory relative to this experimental work is postulated. "The cells in free autogenous human grafts tend to survive following transplantation when they are transplanted as complete cell entities in favorable transplantation sites."

As stressed by Talbot,[160] more transfusions are being given than is either wise or necessary. He lists five hazards in the use of blood transfusions: (1) depression of erythropoesis, (2) homologous serum jaundice, (3) artificial or iatrogenic polycythemia, (4) hemolytic transfusion reactions, and (5) pyrogenic transfusion reactions. The incidence of homologous serum jaundice continues to be distressingly high. When one administers blood to a patient, one is, to a certain degree, dealing with unknown factors and unpredictable effects. Talbot calls to mind that people in and out of blood banks make mistakes.

159. Peer, L. A., and Walker, J. C., Jr.: The Behavior of Autogenous Human Tissue Grafts: A Comparative Study, Plast. & Reconstruct. Surg. **7**:6 (Jan.) 1951; ibid. **7**:73 (Feb.) 1951.

160. Talbot, T. R.: Blood Transfusions, Surg., Gynec. & Obst. **93**:411 (Oct.) 1951.

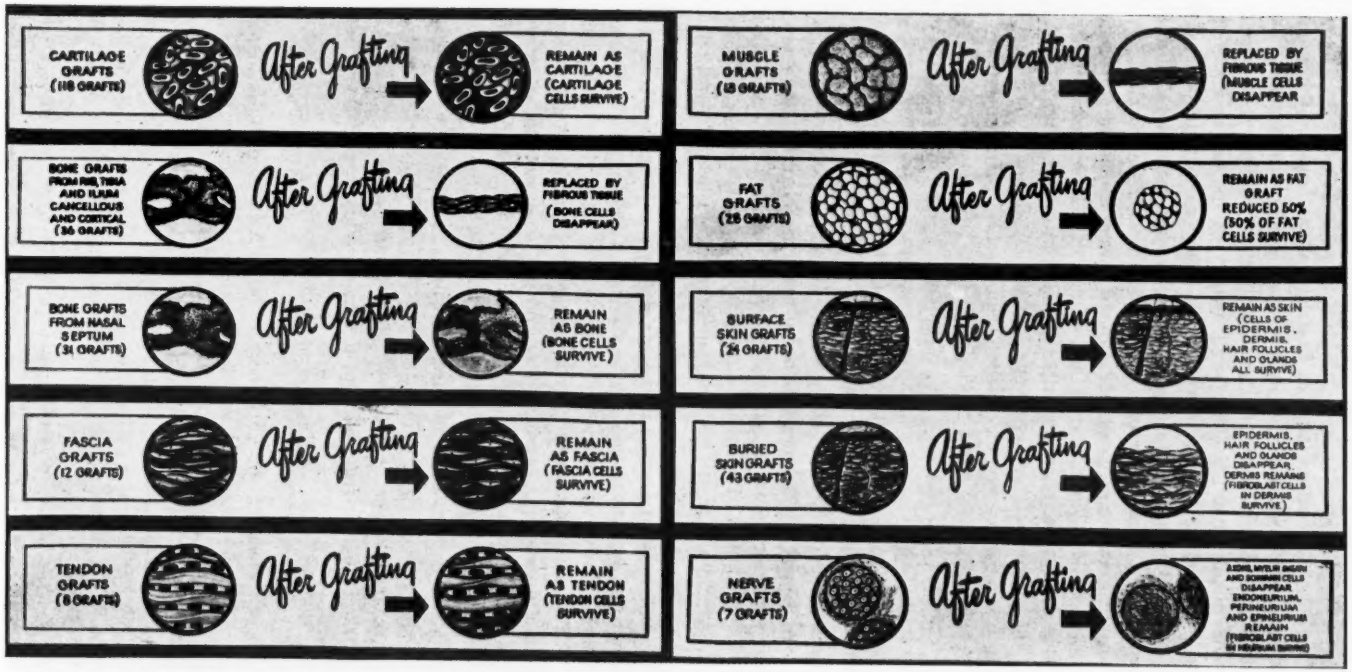
CARTILAGE GRAFTS (118 GRAFTS)
After Grafting
REMAIN AS CARTILAGE (CARTILAGE CELLS SURVIVE)
BONE GRAFTS FROM RIB, TIBIA AND ILIUM CANCELLOUS AND CORTICAL (86 GRAFTS)
After Grafting
REPLACED BY FIBROUS TISSUE (BONE CELLS DISAPPEAR)
BONE GRAFTS FROM NASAL SEPTUM (31 GRAFTS)
After Grafting
REMAIN AS BONE (BONE CELLS SURVIVE)
FASCIA GRAFTS (12 GRAFTS)
After Grafting
REMAIN AS FASCIA (FASCIA CELLS SURVIVE)
TENDON GRAFTS (8 GRAFTS)
After Grafting
REMAIN AS TENDON (TENDON CELLS SURVIVE)
MUSCLE GRAFTS (13 GRAFTS)
After Grafting
REPLACED BY FIBROUS TISSUE (MUSCLE CELLS DISAPPEAR
FAT GRAFTS (28 GRAFTS)
After Grafting
REMAIN AS FAT GRAFT REDUCED 50% (50% OF FAT CELLS SURVIVE)
SURFACE SKIN GRAFTS (24 GRAFTS)
After Grafting
REMAIN AS SKIN (CELLS OF EPIDERMIS, DERMIS, HAIR FOLLICLES AND GLANDS ALL SURVIVE)
BURIED SKIN GRAFTS (43 GRAFTS)
After Grafting
EPIDERMIS, HAIR FOLLICLES AND GLANDS DISAPPEAR, DERMIS REMAINS (FIBROBLAST CELLS IN DERMIS SURVIVE)
NERVE GRAFTS (7 GRAFTS)
After Grafting
AXONS, MYELIN SHEATH AND SCHWANN CELLS DISAPPEAR. ENDONEURIUM, PERINEURIUM AND EPINEURIUM REMAIN (FIBROBLAST CELLS IN NEURILEMA SURVIVE)

Fig. 8.—Peer's experimental series. The charts demonstrate the fate of free living autogenous human grafts in contact with unlike tissues. When these tissues are transplanted in contact with like tissues, the fate of the grafts is the same except in the case of bone grafts from the rib, tibia, or ilium and in the case of nerve grafts. Drawings by Ruth Pullen, R.N. (Reproduced with permission from *Plastic and Reconstructive Surgery.*)

Knisely [161] offers concepts relating to healthy normal blood and vessel walls and points out the developing concepts of intravascular agglutination of the blood and the kinds of damage which circulating blood does to the bodies of animal and man. Laufman [162] calls attention to the wide variety of speculative concepts that have been published on the significance of sludge in diverse pathologic conditions. In a study made by Bloom,[163] dextran was used as a substitute for blood in transfusions for patients in shock as a result of blood loss and trauma. Dextran effectively produces and maintains hemodilution and has the desired qualities of a plasma-volume expander. Craig, Gray, and Lundy [164] believe that as operations take on more and more the characteristics of major procedures, the use of blood and of one of the plasma-volume expanders is at present the most satisfactory way of maintaining a circulatory volume in the cardiovascular system. No untoward reactions have been seen by them as a result from the use of plasma-volume expanders in anesthetized patients. In Hartman's [165] opinion, gelatin, dextran, pectin, and polyvinyl pyrrolidone as plasma extenders appear satisfactory, in the order given, so far as acute tissue changes are concerned for use as emergency or prophylactic measures against shock states.

In considering the problem of exceptionally high temperatures, Mangiardi [166] states that experimental work shows that living tissue does not become irreversibly damaged until the temperature reaches 115 F. The general picture in extreme hyperpyrexia is one of marked metabolic alteration. Oxygen is in great demand but supplied with difficulty. First, the chief mechanism of heat dissipation is the evaporation of water; hence this function should be augmented. Therapy is begun immediately. A battery of electric fans is aimed at the patient. He is sponged with alcohol and ether. He should not be covered. Ice is applied in the groin, axillas, and neck. Treatment is continued vigorously until the temperature falls to 102 F. The second therapeutic plan is carried out simultaneously: supplying oxygen intranasally and administering water and salt as an isotonic saline solution, the amount and rate depending on the individual case. Mangiardi has been using continued infusions of 50 per cent dextrose in distilled water.

The enzymes streptokinase and streptodornase, as stated by Connell and Rousselot,[167] have proved to be effective in the lysing of susceptible portions of wound exudates and sloughs in a variety of surgical lesions. Apparently many different substrates go into the make-up of various sloughs, and these substrates

161. Knisely, M.: An Annotated Bibliography on Sludged Blood, Postgrad. Med. **10**:15 (July) 1951.

162. Laufman, H.: Sludged Blood: A Critique, A. M. A. Arch. Surg. **62**:486 (April) 1951.

163. Bloom, W. L.: Present Status of Plasma Volume Expanders in the Treatment of Shock: Clinical Laboratory Studies, A. M. A. Arch. Surg. **63**:739 (Dec.) 1951.

164. Craig, W. McK.; Gray, H. K., and Lundy, J. S.: Present Status of Plasma Volume Expanders in the Treatment of Shock: Clinical Results in Surgery, A. M. A. Arch. Surg. **63**:742 (Dec.) 1951.

165. Hartman, F. W.: Tissue Changes Following the Use of Plasma Substitutes, A. M. A. Arch. Surg. **63**:728 (Dec.) 1951.

166. Mangiardi, J. L.: Experiences with Postoperative Temperatures Above 108 F.: Use of Hypertonic Glucoses, Am. J. Surg. **81**:189 (Feb.) 1951.

167. Connell, J. F., Jr., and Rousselot, L. M.: The Use of Enzymatic Agents in the Débridement of Burn and Wound Sloughs, Surgery **30**:43 (July) 1951.

will require the proper proteolytic enzyme system for lysis. Reiser, Patton, and Roettig [168] feel that trypsin is the ideal agent for enzymatic proteolytic débridement because it is available in pure crystalline form in vials of standardized potency and stabilized strength. It is supplied in sterile vials under the name of Tryptar by the Armour Laboratories.

In a well-conducted study of the place of antibiotics in plastic and reconstructive surgery at the Brooke Army Hospital, Shaeffer and his associates [169] found as the result of four years' testing in their laboratories that chloramphenicol (Chloromycetin) is currently indicated to be the best all-purpose drug. The drug is now, or will be, commercially available for intravenous therapy in instances in which the oral route is barred.

168. Reiser, H. G.; Patton, R., and Roettig, L. C.: Tryptic Débridement of Necrotic Tissue, A. M. A. Arch. Surg. **63**:568 (Oct.) 1951.

169. Shaeffer, J. R.; Pulaski, E. J., and Tennison, C. W.: The Place of Antibiotics in Plastic and Reconstructive Surgery, Plast. & Reconstruct. Surg. **7**:388 (May) 1951.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Arthur J. Coombs, M.D., *President*

Lawrence J. Lawson, M.D., *Secretary*

March 3, 1952

The Otolaryngologist in a Hearing Conservation Program. DR. RICHARD E. MARCUS.

The Chicago Hearing Conservation Program is the result of cooperation among representatives from the Chicago Medical Society, the Chicago Laryngological and Otological Society, the Board of Education, the Chicago Hearing Society, and citizens' school groups. Trained audiometrists follow a predetermined pattern of testing. Otologic screening clinics have been established for children found to have a hearing loss of 30 db. or more in more than one frequency in either ear. Tentative diagnoses are made in the screening clinics; adequate follow-up is made to ensure the therapeutic and rehabilitative management in private or public hands. Educational placement of children is made on an individual basis, depending on the type of hearing loss, prognosis, and duration.

From September, 1950, to February, 1952, 49,574 children were screened audiometrically. Of these, 2.5% were found to have a hearing loss of 30 db. or more in more than one frequency in either ear. Of these, 85% appeared at the otologic screening clinics, and 84% were found to have a hearing loss, in 63% of whom this had not been previously known. On the six-month recheck of 304 children for whom medical care was recommended and carried out 58% showed improvement, 34% showed no improvement, and 8% were worse. Where medical care was recommended but not carried out, 32% improved, 56% showed no improvement, and 10% were worse. In children for whom no medical care was recommended 58% showed improvement, 35% showed no improvement, and 7% were worse. Of those children referred by teachers from grades other than the ones screened, and from ungraded classes, 5.5% had actual loss.

It is noteworthy that, where medical care was recommended and carried out, 6 out of 10 children showed improvement. In this same group, when medical care had not been carried out, only 3 out of 10 children showed improvement. Statistically, therefore, there is evidence that hearing loss in children can be improved after accurate diagnosis and specific treatment. Further studies are indicated and are in progress.

DISCUSSION

DR. KENNETH NOLAN (Director, School Health Service): Much of the difficulty in the effort to secure optimal educational placement has been due to the fact that the Board of Education and organized medicine, by and large, have not had the opportunity to come together to consider some of these problems. It is heartening that this Society has furnished an excellent example. This has already encouraged several other similar groups to supply consultation and advice on various matters.

The responsibility of the health of the child rests with the parents. The responsibility of the Board of Education is that tax funds earmarked for educational purposes is used; therefore, any project undertaken must be justified educationally. It is justified when it protects the initial investment. It costs $256 a year to keep a child in an elementary school classroom. When he fails a year in school because of poor hearing, it is obviously good economy to have that information beforehand and secure better adjustment and placement for the child. Special school placement has been done in the past, almost entirely devoid of any medical consultation. At this time 60 or more speech correctionists are undertaking correction in speech in many children in whom it has just been discovered that a hearing loss is present. In the rooms for retarded children twice as many mentally handicapped children are found to have a previously unknown hearing loss as children in the regular elementary classrooms.

The otologist can be of great aid in advising on acoustics in newly built schools; auditory considerations are often poor. In one school where a large number of children were seen who, on the basis of initial group tests, were apparently not meeting requirements, it was found that the school's proximity to the airport interfered seriously with the audiometry tests.

Much remains to be done in the program, and further planning will be carried on only with prior consultation and advice of organized medicine.

DR. JOHN L. REICHERT: I have had the opportunity of watching the work of Dr. Marcus and Dr. Nolan from its inception. A planning committee was organized which consisted of all volunteer and official agencies interested in school health. It has been planned as a broad-based city-wide program extending far into the future. Much credit must be given to the Chicago Hearing Society which underwrote the program before official funds could be obtained. Initially a case-finding program was started which went on to the stage of making an exact diagnosis, and that, as Dr. Marcus said, was done through the otologic screening clinics. In these clinics there is no therapy; when the diagnosis is made, the patient is sent to the practicing physician in his office or in the dispensary. Organized medicine has accepted the principle that in community health programs mass diagnosis on a public health basis is justified, but it has strictly adhered to the principle that therapy is definitely the province of the practicing physician.

Here we have a solid program which consists of case finding, diagnosis of hearing loss, and, finally, rehabilitation. Rehabilitation consists not only in giving what remedial care is possible but in adjusting the child to his physical handicap, which is most important.

In one school in the city six children were found who had a remediable hearing loss. Those six children represented a total of 10 semesters of repeated grades because of poor hearing. When the hearing loss was remedied, their work improved, and they will not repeat another semester. Five years of repeats represents, as Dr. Nolan indicated, about $1,200 loss of taxpayers' money. Since there are more than 400 schools, that would mean approximately half a million dollars' annual loss before this program went into effect. In other words, the program is more than maintaining itself.

As has been shown, two-thirds of the children with hearing loss so far uncovered were in school for a long period without the impairment being discovered. Teachers at present cannot be relied upon for screening purposes. The physician has a broad responsibility to the community, and such a program as this enables us to fulfill that responsibility.

DR. ARTHUR J. COOMBS: I should like to ask what the otologist should do, assuming that he is the first to discover impaired hearing in a child. Where should he send the child, and where can the program best be carried out?

DR. KENNETH NOLAN: The physician can apply to the Department of Special Education for placement for the child. If lip reading or other special facilities are required, there are rooms incorporated in the regular schools in various sections of the city. There are also sight-saving classes in rooms in various schools. By the use of a hearing aid in some instances a special class may not be needed.

Otogenic Intracranial Complications in the Antibiotic Era. DR. MARVIN TAMARI and DR. ROBERT HENNER.

In the management of acute otitis media penicillin has proved to be the drug of choice. In those cases in which penicillin is not immediately effective there is a tendency to prescribe an array of antibiotics haphazardly. The procedure of administering multiple antibiotic agents at the same time and without bacteriologic and sensitivity studies has proved of little value and, indeed, complicates the clinical picture. One should be especially alert for the existence of unsuspected complications.

The cases presented were selected from many cases of otogenic problems observed at the Illinois Eye and Ear Infirmary during the era of antibiotic therapy. They serve to dissipate the illusion that mastoid disease is always prevented or cured by antibiotics and to illustrate the need for adequate surgery when indicated. It has been the experience that when surgery is indicated, antibiotics fail to prevent complications or effect a cure. If surgery is necessary, it should be thorough, meticulous, and complete, as the standards of preantibiotic days indicated.

DISCUSSION

DR. ROBERT HENNER: I should like to point out that, in addition to emphasizing the lack of osteoclasis in these cases, a recent article by Mock in *The Journal of the American Medical Association* showed that penicillin favored thrombosis. Dr. Tamari has demonstrated the extensive thrombosis along the dural plate. This brings up the question whether these changes are in fact not a sequel to the use of antibiotics. We intend to make further studies along this line.

Certainly we all hope that future studies in bacteriologic and chemotherapeutic agents will present us with the proper antibiotic for every infection. However, this paper was presented to show that undue reliance upon these agents and the ignoring of the sound surgical principles of the preantibiotic days may cause serious difficulty in the handling of patients.

Arthur J. Coombs, M.D., *President*

April 7, 1952

Thyrotomy Approach for Arytenoidectomy in Bilateral Abductor Paralysis of the Vocal Cords. DR. SAMUEL J. PEARLMAN and DR. EDGAR W. KILLIAN, Chicago.

The authors have reviewed a number of procedures designed to provide adequate breathing space and eliminate the tracheotomy tube in bilateral abductor paralysis, and they describe a method of unilateral arytenoidectomy through a thyrotomy which was performed in four cases. The operations were successful in that all patients have an adequate airway and a useful voice. A comprehensive bibliography is included.

Nasal Implants in Children and in Adults, with Preliminary Note on the Use of Ox Cartilage. DR. MAURICE H. COTTLE and DR. THOMAS J. QUILTY, Chicago, and DR. RICHARD A. BUCKINGHAM, Oak Park, Ill.

During the past five years a large variety of rhinoplastic procedures has been used in the effort to correlate surgery of the external pyramid with intranasal operations in the restoration of nasal function. Among these is utilization of implants of inorganic and organic materials, autogenous and isogenous bone and cartilage. In addition to restoration of contour and establishment of support, functional indications, such as repair of the nasal roof, restoration of the hard nasal septum, narrowing of excessively widened nasal chambers, and repair of deformities of the nasal lobule, are now considered.

The paper discusses the use of bone, fresh and preserved, autogenous and preserved cadaver cartilage, and ox cartilage. No one material is as yet universally adequate; autogenous cancellous bone when indicated is the best graft material available. The authors recommend the use of implants in children, in repair of destroyed septal cartilage following abscess or hematoma, in order to prevent later deformity.

Lawrence J. Lawton, M.D., *President*

Stanton A. Friedberg, M.D., *Secretary*

Monthly Meeting, Nov. 3, 1952

Transantral Excision of the Sphenopalatine Ganglion and Maxillary Nerve for Facial Pain. DR. LEO M. MORSE.

The author attempts to present the diagnostic problem of neuralgia as seen in the otolaryngologist's office. It is hoped to popularize a minor surgical procedure for so-called trigeminal (maxillary) neuralgia with trigger zones. He next presents the more perplexing problem involving the sphenopalatine ganglion complex, with the method of treatment and localization and, finally, surgical relief. He concludes that the rhinologist is best qualified to treat the patient with chronic recurrent head pain.

DISCUSSION

DR. MILTON TINSLEY (by invitation): I have enjoyed Dr. Morse's paper, but I wish to discuss primarily trigeminal neuralgia. I shall not discuss any phase of the sphenopalatine

ganglion syndrome; whether it is possible to make injections into the ganglion or whether in injecting one does not also inject into the maxillary nerve. Nor shall I argue which is the culprit when the maxillary nerve is removed with the ganglion. The diagnosis of trigeminal neuralgia is not difficult. There is nothing that can be mistaken for trigeminal neuralgia. It is localized to the distribution of the sensory division of the fifth nerve, and there is no overlap of pain. The pain is paroxysmal. The treatment is either injection into the nerve or section of the sensory, root with relief.

In the first case presented, if we disregard the pain in the neck and ears we may consider that Dr. Morse was dealing with typical trigeminal neuralgia—that is, if there was no pain between paroxysms. The relief upon section of the maxillary nerve has persisted for more than eight months. Shall we await regeneration of the nerve before judgment as to the efficacy of the procedure? We know that the fifth nerve cannot be killed in its peripheral distribution. One can avulse it, one can inject, one can burn it, one can put objects into the foramina, and it always regenerates and the pain recurs. We should wait until this nerve has had a chance to regenerate, which may take a year or two years.

In the second and third cases, certainly neither patient showed trigeminal neuralgia. In the former, the distribution of pain was not typical. In the latter, as implied and presented, the symptoms were entirely on an infectious basis, producing intracranial and extracranial signs and symptoms. I am at a loss to understand why Dr. Morse believes that removal of the sphenopalatine ganglion would have cured the abscessed tooth.

In speaking of trigeminal neuralgia we should refer to a definite condition and not speak of overlapping symptoms and signs. So far as the statement that recurrent head pain should be in the realm of the otolaryngologist, Dr. Lederer reminded me of a patient we had, who had an acoustic neurinoma, who was treated for sphenopalatine neuralgia by sphenopalatine injection. Recurrent pain in the head may be due to brain tumor or to various other diseases. Also, in the so-called Sluder's neuralgia or sphenopalatine neuralgia the distribution of pain has been found frequently to be associated with herniated intravertebral disk in the cervical region.

The only permanent effective treatment of trigeminal neuralgia is destruction of the preganglionic fibers of the sensory root by alcohol or by section of the sensory root, or by section of the spinal fifth tract in the medulla, a medullary tractotomy. The work of Dr. Love on decompression of the fifth nerve has not been repeated by anybody else. Many times men have gone in and have been unable to section or expose the fifth nerve because of bleeding and have had to terminate the operation, and the patients have been relieved of trigeminal neuralgia for a while. Trigeminal neuralgia is a condition which has spontaneous remissions and exacerbations, and any medical treatment advocated must be considered on the basis that possibly the treatment happened to coincide with a remission.

Dr. Robert Lewy: It is always a pleasure to hear of a new practical operation, and we owe Dr. Morse a debt of gratitude on this. At the risk of being thought presumptious in speaking after a neurosurgeon, I should like to make some comments as an otolaryngologist. We should remember that Sluder's work was by no means always agreed with by others. Vail objected to it strenuously on the basis of involvement of what he thought was the vidian nerve; Higbee had some objection to it, as did Proetz in discussing Higbee's paper; Larsell indicated in some work which he had done that there were fibers of the maxillary division of the fifth nerve which went through the sphenopalatine ganglion.

I must say also that I am not impressed in the clinical history that these are necessarily typical cases of sphenopalatine neuralgia. Further, when both the sphenopalatine ganglion and the maxillary nerve are avulsed surgically, I do not know how one can decide exactly which element is giving the effect described. I recognize that there is no substitute for results, and am pleased that Dr. Morse has apparently obtained these results, but I do not think there has been substantive proof offered anatomically that the sphenopalatine ganglion is specifically involved, except so far as the effect of cocaine or procaine on the sphenopalatine ganglion apparently gave relief. As Dr. Tinsley pointed out, the sphenopalatine ganglion is very close to the maxillary division of the fifth nerve, and injection into one may involve the other. Another element which I think confuses the picture to some degree and makes the ultimate reasoning of the situation difficult is the work done by Lytell on the anterior ethmoidal nerves some years ago. You may recall that he first did cadaver dissection, to actually cut the ethmoidal nerves,

and then proved that by cutting the ethmoidal nerve he could correct pain located in some of the regions described by Dr. Morse. This concept is, of course, more or less academic. As I said, what counts is the results, but I cannot be convinced on the basis of the material thus far offered that the results are necessarily due to any work on the sphenopalatine ganglion; it would be quite possible that the same results would have been obtained had he left the sphenopalatine ganglion alone and sectioned the maxillary division of the fifth nerve.

Dr. Leo M. Morse: When I presented these patients before the University of Chicago group this afternoon, I mentioned that I came for constructive criticism, that I was not prepared to enter into the academic reasons, and that all I had was the practical results. I have been accused of trying to create or revive an operation because of our so-called dying specialty; maybe that is so.

I am not in disagreement with Dr. Tinsley. If we break down this classification and speak of the patient with the typical trigger zone, the otolaryngologist is offering a simple minor procedure in a field in which he is accustomed to work; he knows the anatomy and can perform the operation in a short time. Whether or not he is doing the right thing from the standpoint of research and anatomy and neurophysiology, I cannot attest to that.

Dr. Tinsley thought the third case was on an infectious basis. All these patients had had complete physical work-ups from every standpoint, and Dr. Rasmussen mentioned at the time that this patient might have a mild encephalitis. She had had two lumbar punctures and all findings were negative. Whether or not to remove only the sphenopalatine ganglion or the maxillary nerve I do not know. Whether or not the abscessed teeth remaining after the symptoms are cured should be left in, I do not know. At least in my practice I get the type of patient nobody wants to take care of. They have made the rounds, have seen the neurologist, the pyschiatrist and, incidentally, the third patient, who was a nurse, actually thought she was "crazy" and went to a psychiatrist. Fortunately, a trigger zone developed in the tooth. Are we justified in allowing a patient to go to such lengths when this simple procedure would take care of the situation? I saw her frequently enough to be aware of the morbidity she suffered. I do not know what will result from the abscessed tooth that remained in her mouth, but we did take care of the pain. Incidentally, she had a 25 db. loss of hearing when I first saw her, and according to her, after removal of the tooth her hearing has been restored. I have not checked her audiogram recently because we are giving her a chance to make a recovery.

Voice Rehabilitation After Removal of the Larynx and Cervical Esophagus (Motion Picture). Dr. Edward B. Weisman (by invitation).

A modified electrolarynx was devised to be used in the case of a patient with a partial pharyngectomy, cervical esophagectomy, and total laryngectomy. This instrument is of value during the interim between radical surgery and reconstructive surgery, giving the patient a means of communication.

DISCUSSION

Dr. William F. Waldrop (by invitation): Those of us working in the field of rehabilitation of patients who have undergone similar operations have been trying for years to find various means that would better answer the problem than the two devices usually used: the electrolarynx, which was modified in this case, and the old Western Electric artificial larynx.

We have had no such cases in our rehabilitation service, but recently Duncan Scott, the audiologist working with the speech therapist at Billings Hospital, asked if I would lend him the devices we have, the electrolarynx and the Western Electric artificial larynx. I asked that he return them in a few days, because we like to show them to laryngectomized patients. Fortunately, most of these patients who have failed to master the esophageal method have bought one or the other of these devices and, shortly afterward, have learned the other method; hence we had several on hand. He did return one that I lent him but said that the patient refused to part with the other and that they would have to buy it from us. This is evidence of the dependence of the patient on speech, and in such a case one must resort to the device.

Most of the modifications we have tried to make have not been sufficiently adaptable to make them worth while. I hope that from this modification something will be developed which will be more flexible in its pitch range. In our experience neither the electrolarynx nor the Western

Electric larynx have enough variance in pitch to be very practicable. There are one or two other instruments somewhat similar to the artificial larynx, with a reed which is somewhat more flexible, and we have recordings from persons who have obtained, in addition to the voice inflections in intensity obtained with these instruments, a certain amount of variation in pitch, so that there is actually a pitch inflection. I should like to see such an instrument tried in a similar adaptation. This, I understand, was more a temporary arrangement to serve between the two surgical procedures, and I should certainly be interested to learn more about it. This case presented a problem which was not present in the case at Billings Hospital, and has been solved in a very practical manner.

DR. B. J. SOBOROFF: Dr. Weisman is to be congratulated in handling so ably the problem we had at the Illinois Eye and Ear Infirmary. It was not only that of providing a voice for a patient who was unable to communicate because he could not write, who had had his larynx and pharynx removed, but also the problem of handling a stoma in the floor of the mouth which is automatically created when a laryngopharyngectomy is performed. There is little information available as to how such a double problem could be met. Other men, in such cases, have provided plastic tubes which fit into the floor of the mouth and lead into the esophageal stoma to collect secretions and provide a solution to that part of the problem, but of course that does not provide the ability to speak.

This device has not only sealed off the lower portion of the large stoma, but it also provides a means of bringing the secretions down from the mouth and the upper portion of the pharynx into the esophageal stoma. It might be said that this is only a temporary measure, yet with the reports that have come from the Memorial Clinic as to the improved results in lesions of the hypopharynx with surgical procedures, with the necessity for more extensive surgery in order to obtain these improved results (in this case a laryngopharyngectomy with right radical neck dissection), it is necessary to provide early rehabilitation, and the problem then arises as to reconstruction of the pharynx. This will be the next step, but it may be months or a year before the entire hypopharynx and pharyngeal area can be reconstructed with two pedicle flaps from the chest; so it is very important that something of this sort be used in the interim. Dr. Weisman has produced a practical solution to this difficult problem.

DR. A. H. ANDREWS: We have been endeavoring for some time to solve some of the energy problems in connection with the artificial production of sound. Dr. Weisman's work suggests the application of the electrolarynx, and, if successful, this will constitute a simpler solution than has been provided by our acoustical engineer. Dr. Weisman is to be congratulated on his work and its presentation.

DR. EDWARD B. WEISMAN: I should like to thank Drs. Waldrop, Soboroff, and Andrews for their kind discussion. Apropos of Dr. Waldrop's inquiry, our difficulty, as Dr. Soboroff verified, is that ordinarily the laryngectomized patient does not have the problem of a pharyngeal stoma; there is continuity between the pharynx and the esophagus. This patient had surgery which was much more extensive. I inquired about devising a more compact electrical apparatus, and the cost to engineer something electronic was about $3,000; so I decided that this would be a little cheaper although somewhat clumsier.

Speech, Hearing, and Language Disorders: A Frame of Reference for Research and Therapy. HELMER R. MYKLEBUST, Ed.D., Evanston, Ill. (by invitation).

In the past disorders of communication were considered mainly as disorders of speech. It is now recognized that ability to communicate is more than ability to speak, and, with this awareness, has come a greater understanding of language and language disorders. Basically, study of the communication process entails study of language. For this purpose language can be divided into three areas, (1) expressive language—the ability to use language in speaking and writing; (2) receptive language—ability to understand what other people say (hearing) and the ability to understand what has been written (reading); (3) inner language—the ability to use language to communicate with oneself.

Disorders of language can occur in any of these three areas or in various combinations of them. Furthermore, there is a reciprocal relationship between these language functions. In order to have expressive language (speech) one must first be able to hear. There is a reciprocal

relationship between hearing and speaking defects. Furthermore, the individual cannot understand what other people say, nor can he speak, until he has acquired a minimum of inner language.

We are gradually learning more about the process of language acquisition. We are now aware that there are two basic avenues through which the child learns language. These are the sensory avenues and what we have termed the psychologic avenues. It is possible for a child to have normal sensory avenues but not acquire language normally because of marked emotional difficulty, which blocks the psychologic processes of language acquisition. In order for language to be acquired normally it is necessary for both the sensory and the psychologic avenues to be working harmoniously.

Language disorders may be classified under symbolic language disorders, which are the aphasias; receptive language disorders, which derive from disturbances of the sensory processes, including both hearing and vision (these receptive disturbances may be classified into central, peripheral, and psychologic), and expressive language disorders, which include dysarthrias, voice problems, delayed speech, stuttering, mutism, etc. (these, too, may be classified under central, peripheral, and psychologic disorders).

Careful study and classification of the language disturbances will lead to better understanding of one of man's basic characteristics, that of ability to function symbolically. The otologist has a prominent part in this study because he is dealing with hearing, one of the basic senses affecting symbolic functioning in man.

DISCUSSION

Dr. Richard E. Marcus: It is extremely difficult to discuss the whole area of hearing, speech, and language disorders in the time Dr. Myklebust had at his disposal. It is even more difficult to get into classification of aphasias, especially in children, because at that point the controversy becomes almost unsolvable.

We have seen a number of children of the types Dr. Myklebust has described. We have seen them when the parent brings the child in because at the age of 2 he does not speak, thinking that the tonsils may be diseased or enlarged and that this may have something to do with the fact that he does not speak. Where can one begin to make the differential diagnosis? It would have to start in the history obtained from the parents, especially as it relates to any changes that might have occurred in intrauterine life; it would have to include such possibilities as birth damages, anoxia, and anything that might demonstrate brain damage. It would then step to an evaluation of the child himself, and here is where Dr. Myklebust has tried to tell you that one of the ways in which you can approach an aphasic child is by observing his behavior. Children who have brain damage, for instance, and who do not speak behave in a different way from children who have a peripheral deafness and do not speak.

In addition, we have now available such procedures as electroencephalography, with which we feel that we can demonstrate not only whether there is or is not hearing but also whether there is or is not brain damage (some of Dr. Myklebust's classifications may gain added validity as the evidence gained from electroencephalography is correlated with clinical observation).

The field of communications disorders is one in which we can all cooperate to mutual advantage. As otolaryngologists we are in it and, I believe, to stay. We need to know the kinds of basic sciences, as Dr. Myklebust pointed out, that apply to disorders of communication, not necessarily histology or biochemistry or physiology, but rather the anatomy and function of human behavior. We are on the periphery of these areas, but we need to gain more specific knowledge in the field of human behavior, especially as it relates to the rehabilitation of the patient with a speech or hearing disorder.

Dr. Myklebust's introduction to speech, hearing, and language disorders is very much to the point. I should like to make one further comment. He referred to so-called tone deafness in children. We have seen such children and, after rather careful investigation, we find that the child originally believed to have tone deafness either was afraid of the audiometer in many instances, and did not respond until the fear had been overcome, or could not understand the kind of response that was required and consistently waited until the volume was turned up to 50 or 60 db. Often such a response was maintained through many tests until we could explain

that the response was expected at a lower volume. We found, too, that the hearing for speech for these children was perfectly normal. I do not believe that a special category is as yet necessary for that kind of child.

DR. THOMAS C. GALLOWAY, Evanston, Ill.: Years ago this subject seemed very simple. We knew, for example, that when we had a left temporal sphenoidal lobe abscess in the area of the posterior half of the first central convolution we interrupted connections to a sort of telephone exchange and got aphasia. It was simple, but the trouble was that we could do little about it.

One might get the impression from Dr. Myklebust's scholarly presentation that this is an abstract and impractical approach to the problems of speech. I have seen him work with these aphasic children, and one could not tell superficially whether they were imbeciles or whether they could not hear. They apparently had no contact with the realities of life; they had no opportunity for education, and they were shut off from the world. By practical application of the principles he has enunciated he has taken some of those children who had been classed as very subnormal and, in a few months in some instances, he has brought them up to a normal level of social behavior and education. This is not theoretical; it is a practical approach to the problem of speech. It depends, however, on a searching analysis of many factors which we have taken for granted, and it is something we must appreciate if we are going to get results with these children who otherwise might be tremendously handicapped but need not be.

Lawrence J. Lawson, M.D., *President*

Stanton A. Friedberg, M.D., *Secretary*

Monthly Meeting, Dec. 1, 1952

Mucocele of the Frontal Sinus. DR. S. M. MORWITZ.

This case is presented from two standpoints: that of pathogenesis and that of surgical procedure.

T. H., a man aged 28 when first examined, in August, 1942, gave a history of two right external frontal sinus operations for mucocele and removal of the left lacrymal sac between five and seven years ago. He suffers from recurrent sinus infections. Recently there appeared a swelling in the right inner orbital region, with the right eyeball pushed downward and outward. A soft protruding putty-like mass was palpable at the floor of the right frontal sinus; the eyeball was displaced downward and outward, with diplopia present on looking to the extreme left. An x-ray of the sinuses indicated a round mass in the right frontal sinus extending beyond the midline and through the floor of the sinus, with haziness of the left frontal sinus.

On Sept. 14, 1942, under local anesthesia, the right frontal sinus was explored via an external approach. The incision followed the existing curvilinear scar along the eyebrow and along the right border of the nose. An enormous mucocele was encountered; a section of the inferior wall of the sinus was gone; the midseptum was perforated, and the floor of the sinus was devoid of mucosa, possibly from previous operations. Recovery was uneventful and the eyeball receded. Thereafter there were recurrences of short duration several times a year, with headache, prominence, and recession of the right eyeball. After each attack the Van Alyea trocar and Ritter sound readily entered the right nasofrontal duct.

On April 8, 1949, another operation was performed because a large mucocele again presented in the right frontal sinus, with marked displacement of the eyeball and diplopia. With the patient under intravenous thiopental (Pentothal) sodium anesthesia the approach into the sinus was through the present scar and a large mucocele was removed. Most of the inferior wall of the sinus was gone, as was most of the midseptum between the frontal sinuses. A deviated portion of the nasal septum superiorly was removed by submucous resection, and a rubber tube was kept in the nasofrontal duct for ten days. Uneventful recovery with marked recession of the eyeball ensued. Large Ritter sounds easily entered the right frontal sinus. The patient still continued to have recurrent episodes of right frontal sinusitis. In November, 1951, two and one-half years after the second operation (the fourth operation on that sinus) 2 cc. of thick

mucus was aspirated from a slight bulge below the right eyebrow. There was an apparent tendency toward recurrence of another mucocele. To date it has not reached large proportions, because there appears to be some drainage into the nose.

At the last examination, on Dec. 17, 1951, there was no prominence in the right inner orbital angle, no diplopia, some displacement of the eyeball, and no fusion. Vision was 20/40 in the right eye and 20/30 in the left eye; with corrective lenses vision was 20/25 in each eye. Further surgery is still a possibility.

In appraisal of this case, the following conclusions become suggestive: 1. The recurrent nasal accessory sinus infection was a factor in causing the mucocele to recur in spite of a patent duct. 2. Complete removal of the sac and lining membrane of the sinus did not prevent recurrence of a mucocele. 3. Four external frontal sinus operations failed to produce a complete cure. 4. Should it become necessary again to evacuate a progressing mucocele, the Goodyear intranasal operation might now adequately provide sufficient drainage into the nose and perhaps circumvent future cystic formation in this sinus.

DISCUSSION

DR. JACK ALLAN WEISS: A few salient points in connection with Dr. Morwitz' excellent presentation might be emphasized. Removal of the mucosa is a matter of judgment, and considering that the mucosa is frequently thinned and inoffensive it can and should be left. Areas of increased hypertrophy, when found, should be removed. The intranasal operation, while feasible, is certainly not applicable in the majority of cases. The maintenance of the postoperative connection between the frontal sinus and the nose, which is so essential, could be discussed at great length. Suffice it to say that in surgery of the mucocele it seems to present a somewhat less serious problem than in chronic suppurative sinusitis.

Another point is the occurrence of exposure of the dura and, correlated thereto, the possibility of intracranial complications when and if a pyocele occurs. There is a variation in the incidence of dural exposure, not related to the size of the mucocele.

[Slides] Slides 1, 2, and 3 illustrate one of the cases I reported in 1941. This mucocele measured 10 by 8.5 by 6 cm. The entire anterior wall and the entire floor of the frontal sinus were absent, and there was considerable extension backward into the orbital plate of the frontal bone. Despite all this there was no exposure of the dura, in contrast to another of my cases in which there was a small external swelling and a rather large exposure of the dura. Removal was done by the external approach, leaving a considerable defect which it was intended to repair by plastic reconstruction. However, the patient died a few months subsequent to operation, following a cholecystectomy.

Slide 3 gives an idea of the roentgenologic findings, which are variable, depending on the size of the mucocele, the direction of its extent, the degree of erosion of the bony walls, the amount of mucosal hypertrophy, and the viscidity of the fluid content. Usually there is increased opacity of the sinus, with some increase in its gross outline and smoothing of the customary scalloped border. The septa disappear. The orbital roof and anterior sinus wall may be defective or absent. There may be marginal density due to irritative osteogenesis. Paradoxically, there may be increased radiolucency in a mucocele despite the fluid content and even the possible thickened mucosa, due to the fact that thinning or erosion of the bony anterior wall more than compensates for the amount of density afforded by the contents and the thickened mucosa.

This slide shows the histopathology; the sinus mucosa was thin except for the anterior wall, which was about 9 mm. in thickness; that portion was removed. The epithelium of the hypertrophied noninflammatory mucosa is variable, either ciliated columnar or pseudostratified in areas. There is thick new connective tissue stroma with a considerable amount of new capillary formation and a scattering infiltration of cells of chronic inflammation, plasma cells and lymphocytes as well as red blood cells and fibroblasts. An occasional mucous gland is present.

DR. GEORGE H. WOODRUFF, Joliet, Ill.: In a large mucocele such as has been illustrated, it seems to me that we should aim at obliteration of the sinus if possible; that is about the only way of obtaining a reasonably sure cure. In the smaller types, if one is able to construct a patent duct that will stay patent, that may well suffice; but in the extremely large ones all the mucosa should be removed and enough bone to allow the sinus to become obliterated. In many cases this will cause far less deformity than anticipated.

Continuously Open Eustachian Tube with Malingering. Dr. George H. Woodruff, Joliet, Ill.

The patient was a 44-year-old well-nourished robust man. The condition followed a fairly extensive first degree burn of the left side of the body, face, and external ear. Both ear drums were normal except for slight atrophic changes. The symptoms were rumbling noise in the left ear, headache, and deafness. The audiometer showed nearly normal hearing in the right and almost total deafness of the left ear.

After several examinations the left Eustachian tube was found to be abnormally patulous. This was corrected by two insufflations of salicylic acid and boric acid powder. The tinnitus ceased entirely, but there was no improvement in the almost total hearing loss in the left ear. After various tests were performed a diagnosis of malingering was made. This was an industrial case, and true complete deafness would have been compensable. In conversation with the patient, he was told, "The examinations we have made and the tests performed show that you should hear better than you do." He said nothing at the time, but on his next visit the hearing was definitely better and the improvement continued steadily until his discharge two weeks later, when the audiometer showed the hearing to be approximately equal in the two ears at the level of 20 db. in the speech range. The whispered voice was heard at 30 ft. (9.2 meters) in each ear.

It was felt that the words used in telling the patient the results of the hearing tests were important. He was never told that he was malingering; in fact, it was never even hinted at. He was merely told that the tests showed he should hear better than he did, and he apparently took the hint.

In reply to the question as to whether the tinnitus subsided, when the tube was closed the tinnitus did subside but the hearing did not improve. The typical history in most cases is of a roaring tinnitus. If questioned the patient will say he can hear his own breathing; the roaring tinnitus is in time with respiration. Many patients breathe through the mouth rather than the nose because this lessens the tinnitus. The tube can be closed temporarily if the patient lies down or bends over.

Pulmonary Hemorrhage and Poliomyelitis. Dr. Robert Lewy.

A 20-year-old white woman suffered from acute poliomyelitis of the bulbar and spinal type. During the course of the disease her condition necessitated a tracheotomy. This afforded relief, and the patient's general condition proceeded to an improved phase. However, there developed severe hemorrhages, which came from the lung and were aspirated through the tracheotomy opening. Bronchoscopic study of the pulmonary bronchial tree was done, but with no specific bleeding areas found. No bleeding areas of importance were found around the stoma. Despite bronchoscopy and all known general methods of control, the patient bled repeatedly and finally died.

At autopsy no explanation was found for the bleeding. The cause remains unknown, but it is suggested that pulmonary bleeding during the course of the disease, like gastrointestinal bleeding, remains a grave prognostic sign.

Discussion

Dr. Thomas C. Galloway, Evanston, Ill.: In my experience hemorrhage from the respiratory tract has been very rare in poliomyelitis. In this case there may have been some obstruction, with increase of negative intrathoracic pressure and cupping action on the capillaries. That would be the simplest explanation. However, two years ago we had many cases in which, when a stomach tube was passed we aspirated blood from the stomach. We have had in three cases of poliomyelitis what appeared to be Cushing ulcer, which is supposed to be associated with a lesion in the hypothalamic area. One patient had a perforation of the stomach and the diaphragm, peritonitis, and empyema. There have been two others with perforations in the esophagus.

Dr. Robert Lewy: In reply to the question as to whether the administration of crystalline trypsin (Tryptar) had any relation to the hemorrhage, I might say that as soon as the hemorrhage began the use of trypsin was stopped immediately, because while this trypsin research problem was being studied it was thought that possibly the enzyme could contribute to hemor-

rhage. It was used in a low dilution in the series of cases. This was the only case in which there was a possible connection between the trypsin and the hemorrhage; I do not believe that there was any connection. In higher concentrations the enzyme is rather irritating.

I feel confident that in this case the bleeding was pulmonary rather than gastrointestinal, because the blood came directly out of the tracheal stoma and it was fresh red blood. There is some virtue in the prevention of crusting and other processes which occur in the blocking of bronchi in tracheal operations of various types, as, for example, in tracheobronchitis.

Otogenic Brain Abscess. PIERCE W. THEOBALD.

A 35-year-old white man had a history of a perforated tympanic membrane on the right side since early childhood, with occasional episodes of foul-smelling discharge from the ear but no other associated symptoms, such as headache or vertigo. Because of his religious beliefs he had not sought medical care until Feb. 17, 1952, when he consulted a physician because of gradual onset of pain in the right ear, mastoid, and neck, with elevated temperature. Several penicillin injections were given, without relief. Three days later the ear began to discharge, the discharge being about normal in amount and character as compared with previous episodes. He then sought aid from chiropractic manipulations, but these, too, failed to relieve his symptoms. On March 2, two weeks after the onset of pain in the ear, he became stuporous, and he was admitted to the neurosurgical service of St. Luke's Hospital on March 3, with a temperature of 99 F.

Examination revealed bilateral papilledema of 2 D. with perivascular hemorrhages. The right pupil was large and did not react to light or in accommodation. There was third nerve paralysis on the right with ptosis, and moderate central paresis of the seventh nerve on the left.

The left tympanic membrane was normal. The right external auditory canal was filled with thin purulent material. The large attic fistula was filled with granulation tissue and cholesteatoma. In the Weber test there was lateralization to the right. The Rinne test was negative on the right and positive on the left. There was slight left hemiparesis with hemihyperesthesia. Deep reflexes on the left were slightly hyperactive; superficial reflexes were hypoactive. Babinski reflexes were present bilaterally.

A diagnosis of right temporoparietal lobe abscess was made. The day following admission, the abscess was located by an approach through the temporoparietal region and about 30 cc. of foul green pus was removed. Further exposure revealed a definite capsule, in which was placed a soft rubber drain and 500,000 units of penicillin was instilled. Improvement was noted the following day and another 500,000 units of penicillin was instilled into the cavity, but one hour later the patient had a convulsion and the temperature increased to 103.2 F. The drain was removed, and the patient's condition improved rapidly. Culture of the material from the abscess revealed Escherichia coli and a Streptococcus of the viridans group.

Fourteen days after the neurosurgical operation a right endaural radical mastoidectomy was performed. Audiometric examination the day before surgery revealed a 60 db. hearing loss on the right with normal hearing on the left. The appearance of the ear was unchanged, although the patient had received intramuscular injections of crystalline penicillin G procaine (Crysticillin) during the entire hospital stay, varying from 300,000 to 600,000 units twice daily. A fistula test was positive.

When a perforating burr entered the antrum, thick pus under pressure was encountered. The mastoid and middle ear contained a large cholesteatoma, extending into the mastoid tip, and granulations, which were entirely removed. The facial nerve and its Fallopian canal were intact. The lateral sinus plate and tegmen showed no signs of breakdown. A small fistula was noted in the horizontal semicircular canal. The entire cavity was grafted with split thickness skin grafts from the thigh. Culture of pus from the mastoid showed E. coli, one of the organisms found in the brain abscess. The viridans Streptococcus was not cultured, possibly because of continuous penicillin therapy.

The postoperative recovery was uneventful; the patient was discharged from the hospital on the 6th day after mastoidectomy (the 21st hospital day). When last seen, on Nov. 1, 1952, he was normal in every respect and had been back at work for several months. He has no memory, however, of events immediately preceding and following the first operation. The ear has been dry since two months following surgery.

DISCUSSION

DR. THOMAS C. GALLOWAY, Evanston, Ill.: I believe that this abscess could have been cared for just as well through the radical mastoid approach, thereby subjecting the patient to only one operation. I wonder how Dr. Theobald feels about that.

DR. SHERMAN SHAPIRO: How long was the drain kept in the abscess? Does Dr. Theobald feel that the cavity is sterile and that the situation will not recur?

DR. PIERCE W. THEOBALD: I believe that Dr. Galloway is correct and that the abscess could have been taken care of just as well through a radical mastoid wound as via the neurosurgical route. On the other hand, we younger men do not see the cases that the older men in the Society have seen, and I feel, therefore, that the neurosurgeon is better trained to perform intracranial procedures. During my training I saw only one case of supposed otogenic brain abscess in which operation was done through the mastoid, at the insistence of the neurosurgical service, and it turned out that the patient did not have a brain abscess.

The drain in this case was left in the abscess cavity for only two days and was removed on the occurrence of acute increase in fever and convulsions. As to whether the abscess cavity is sterile and completely obliterated I cannot say, nor do I think anyone else can. The patient has been well since March, 1952, nearly nine months, but whether he will remain so I cannot say.

Late Development of Laryngeal and Pharyngeal Carcinoma in Previously Irradiated Areas. PAUL H. HOLINGER and LIEUTENANT WILLIAM F. RABBETT (MC), U.S.N.R.

Three cases of carcinoma of the pharynx and larynx are reported in which the tumor developed in an area previously irradiated for a benign process. A review of the literature reveals reports of 9 similar cases; three of the patients were male and eight were female in the total of 12 cases. All had received irradiation 16 to 32 years before development of the neoplasm; seven received irradiation for tuberculous cervical adenitis and five for thyrotoxicosis. Cases of carcinoma of the skin developing in a previously irradiated area are well known. Recently, malignant neoplasms have been reported developing in deeper structures previously treated for benign lesions. This has occurred in bones, as in the development of bone sarcomas in areas treated 3 to 12 years previously for tuberculous arthritis, and carcinoma of the cervix developing 10 or more years after irradiation treatment for a benign lesion of the cervix.

While statistically the series of 12 pharyngeal and laryngeal carcinomas is small, it would be difficult to believe that the association of the irradiation and the development of the tumor is merely coincidental. Since irradiation therapy for benign conditions of the neck was commoner several decades ago, more of these cases may be seen in the near future.

DISCUSSION

DR. M. F. SNITMAN: This spring at the meeting of the National Cancer Society, Dr. Lauren Ackerman called attention to the importance of continued observation of patients who have received irradiation therapy for oral carcinoma, because in his experience it is not unusual to find at a later date the development of a new lesion which had no direct connection with the original primary lesion. One might ask whether the second primary growth was due to the irradiation effects or to the same condition that caused the first primary. In my observation of patients treated for pharyngeal carcinoma who have a five-year cure, I have as yet not found development of a new carcinoma in the pharynx, although I must admit that a period of 5 or 10 years' observation is insufficient for we are well aware, of course, of the cancerocidal effects of irradiation, and I think Dr. Holinger's paper should bring to mind the possible effects that may accrue from irradiation therapy of the overgrowth of the pharyngeal tonsil causing Eustachean tube obstruction.

DR. PAUL H. HOLINGER: Dr. Snitman's comments about irradiation of tissues in the postnasal space are important. When one sees such irradiation done indiscriminately, sometimes repeated several times without knowledge of the previous dosage the patient may have had, one recognizes a similarity in the history between these patients and the ones herein pre-

sented. When one finds an atrophic rhinitis and pharyngitis sicca with extensive scarring and crusting and obtains the history of several "courses" of postnasal irradiation, one must be concerned about possible late development of carcinoma in such cases.

Sudden Death Following Radical Mastoidectomy. GEORGE E. SHAMBAUGH JR.

A 60-year-old white man was referred to the Ear, Nose and Throat Clinic of the Montgomery Ward Clinics on June 3, 1952, because of constant drainage from the right ear for about 55 years, with pain in the right mastoid for many years. Examination revealed an anterior attic perforation in the right ear with a foul purulent discharge. Attic irrigation on three successive visits obtained cholesteatomatous material. Because the discharge and pain persisted, surgery was advised.

This man had been seen previously in the diagnostic, circulatory, and gastrointestinal clinics. On the basis of history and electrocardiogram, a diagnosis of old coronary occlusion was made. There were symptoms suggesting peptic ulcer. X-ray studies showed a hiatus hernia, no evidence of gastric or duodenal ulcer. Esophagoscopy was attempted in the medical gastrointestinal clinic on Aug. 6, but the patient vomited 120 to 150 cc. of coffee-ground material, and the examination was discontinued. Ten days later esophagoscopy revealed inflammation of the lower end of the esophagus. Three days later the patient was given medical clearance for mastoid surgery.

On Sept. 9, a Bondy modified radical mastoidectomy was performed by the endaural route. The operation was begun under local anesthesia with 3 grains (0.19 gm.) pentobarbital sodium (Nembutal) and 1/6 grain (10 mg.) of morphine sulfate for sedation. Owing to the patient's discomfort, the operation was continued under thiopental (Pentothal) sodium anesthesia, a total of 1 grain (0.065 gm.) being given in two and one-half hours. A cholesteatomatous sac was found to occupy the attic region.

This man's blood pressure, which had varied between 130 and 140 systolic and 80 and 90 diastolic in the previous three months, was 110/60 at the beginning of anesthesia and 90/50 at the end of the operation, but he had a good pulse with a rate of 80 and a respiration rate of 20. He returned to bed at 5 p. m. in good condition; his blood pressure remained about the same until at 6:30 p. m. it fell to 78/50, the respiraton rate had increased to 24 and the pulse rate to 126. At 7 p. m. he responded to questions and continued to respond until 8 p. m., when the blood pressure fell to 80/60, he became unconscious and ashen-gray in color, with a pulse rate of 120. Oxygen and dextrose saline intravenously were begun. At 8:30 he was given a vasopressor; at 8:45 he suddenly vomited about 1 qt. (0.9 liter) of coffee-ground material and five minutes later suddenly died.

Unfortunately, permission for autopsy was refused by the only relative, a brother, who did not come in until next morning, when he arrived inebriated and abusive. Therefore, we can only speculate that this man presented the picture of fatal circulatory collapse 3 hours 50 minutes after return to bed from surgery, preceded by a low blood pressure that began to fall during surgery. The copious coffee-ground vomitus, with the long history of gastric symptoms, suggests a bleeding lesion of the stomach, a varix, an ulcer, or a neoplasm. Certainly the blood loss during the mastoidectomy was hardly sufficient to be a factor in the circulatory collapse.

It is worth mentioning that this is the first surgical death in approximately 3,500 endaural procedures at Wesley Hospital during the past 11 years. It seems unlikely that the surgical procedure was the immediate or contributing cause of death in this case.

DISCUSSION

DR. MARY KARP, Highland Park, Ill.: The history of this patient is of interest. There had been several coronary episodes, the first in 1937, when he was bedridden for six weeks, and another in 1948, after which he was unable to work for one year because of dyspnea, chest pain, and orthopnea. The electrocardiogram on his first admission to the clinic showed no diagnostic deformities; however, electrocardiography was not repeated. Several further visits confirmed the diagnosis of esophageal hiatus hernia, chronic pyelonephritis, and chronic otitis media with cholesteatoma. On Aug. 18 the medical department gave clearance for surgery. Dr. Shambaugh has given the details of the subsequent course.

Although autopsy was not performed, one can postulate that coronary thrombosis or circulatory failure occurred. Whether this occurred in relation to surgery and whether it might have been avoided are unanswered questions. Could it have occurred when the local anesthetic with added epinephrine was absorbed? The first blood pressure reading in surgery showed a fall of 50 points of systolic pressure. This might have been due to the secondary effect of epinephrine, to the heavy preoperative sedation, to reaction to local anesthesia, or to coronary occlusion. A blood pressure drop in a hypertensive patient may be significant, for he may need a working head of pressure for adequate circulation, especially if the coronary circulation is already impaired. This patient's hemoglobin was 11.1 gm., or 71%. This anemia may have placed a further load on the oxygen-carrying power of the circulation and on the small cardiac reserve. Certainly the depression of circulation caused by thiopental anesthesia of 170 minutes' duration added its weight. Although no artificial airway was used, the anesthetist stated that the breathing was unobstructed throughout. Occult hypoxia may have existed, to add another factor.

The case brings up several points: First is the need for more thorough preliminary evaluation of the cardiac status. Perhaps if the entire team had been cognizant of this man's poor cardiac reserve, surgery might have been delayed or premedication altered, or attempts made to avert hypotension during and after surgery. One might postulate that the use of arterenol (nor-epinephrine) during the surgical procedure and later to increase the peripheral response of the coronary circulation might have changed the result. We have seen several cases of massive proved coronary infarction which have responded when the shock factor occurred, by treatment with controlled arterenol intravenously. Another point is the need for a planned general anesthesia with control of the airway. This is especially indicated when general anesthesia is used for procedures on the head and neck.

Dr. George H. Woodruff, Joliet, Ill.: Dr. Shambaugh mentioned a possible gastric hemorrhage. It could be that the restlessness under anesthesia was due to such an occurrence. Many patients who have hemorrhage are restless, and this might have been a factor in the unsatisfactory local anesthesia.

Dr. George E. Shambaugh: I wish we could call this something else than death following radical mastoidectomy, but, unfortunately, that is what it was. We do about 50% of our radical mastoidectomy operations with local anesthesia. When necessary, we supplement with thiopental, and a very small amount of thiopental will carry the patient along quite satisfactorily after the premedication used for the local anesthesia. We have not felt the need for intubation in these cases. The radical mastoid operation itself as performed now is certainly a procedure with a minimum of shock and a minimum of risk. This patient died evidently of some associated condition which was not thoroughly understood in advance. Our fault lay, I think, in not being careful enough in the preoperative workup. The patient had been given medical clearance for surgery but, nevertheless, apparently died of a cardiac or gastric condition that was present before surgery.

Radical Neck Dissection for Hodgkin's Disease. Dr. Irwin D. Horwitz.

There is a growing tendency to regard Hodgkin's disease not as a generalized disease of the lymphatic system but rather as unicentric in origin. This theory carries the implication that the disease may be curable. Surgery is becoming increasingly used, either as an adjunct to irradiation or as the primary therapy. Reports of median survival rates of 5 years or of patients living 6 to 14 years disease-free after surgery tend to show that this type of therapy is definitely helpful. Even if not curative, excision of the primary lesion seems to alter favorably the subsequent course of the disease.

Indications for surgical intervention are strictly limited: (1) The lesion must be isolated to one portion of the body; (2) its surgical removal must be technically feasible, and (3) there must be no systemic manifestations of the disease, such as fever or anemia. These criteria were met in the case of the patient to be described.

A 34-year-old white woman, in apparently good health, consulted her physician because of a painless swelling of the left side of the neck. He thought that it might be a nonspecific adenitis, since the patient was recovering from a cold. One week later the mass was undiminished in size, and its removal was advised.

Physical examination revealed a mass about in the left posterior triangle of the neck just above the clavicle. It was about 4 cm. in extent, nontender, slightly movable, and not attached to the overlying skin. There was no evidence of other adenopathy. X-rays of the chest and abdomen were negative, as were blood tests.

On April 11, 1952, the tumor mass was excised. It was lying on the floor of the posterior triangle, and the clavicular head of the sternocleidomastoid muscle had to be transected to mobilize it. The pathology report was Hodgkin's disease.

On April 18, 1952, a radical neck dissection was performed. Careful histologic study of the specimen did not reveal any other foci of disease.

The postoperative course has remained uneventful, and the patient is disease-free when checked by palpation, x-ray, maintenance of weight, and lack of anemia.

DISCUSSION

Dr. Stanton A. Friedberg: The hopeless outlook in Hodgkin's disease has recently inspired more drastic surgical attempts to remove unicentric foci of the disease. However, in a series of 250 patients recently reported from Memorial Hospital, only two had lesions which definitely could be regarded as representing isolated foci. It must be remembered that no one can foresee whether the disease will remain limited or whether radical treatment will result in long-term survival.

It is true that Hodgkin's disease usually runs a rapid course, but it is also true that numerous patients survive for many years as a result of effective irradiation of new areas of involvement as they appear. In a series of cases of lymphoma currently being studied, our experience has been that isolated foci in the upper passages have been cured, only to be followed by reappearance of the condition in the thorax or abdomen after varying periods of latency.

All attempts to reduce the mortality in Hodgkin's disease are meritorious, but they must be judged from the point of view that this is a systemic disease and is usually of multicentric origin. Because of the radiosensitivity of the lymph nodes in this and other types of lymphoma, the use of radiation after surgery is more logical and effective than in treatment of almost any other form of malignant neoplasms. Since all surgically-treated patients are also treated by irradiation, the results will be difficult to evaluate, particularly since long-term survivals with irradiation alone are not uncommon.

Dr. M. F. Snitman: I do not wish to detract from the value of radical surgery for localized types of lymphoblastoma, but the question in this case is the possibility of error of diagnosis. No two pathologists will always agree, especially when dealing with tumors of the lymphatic system. Dr. Horwitz will remember the patient we observed about two years ago with the large node in the right supraclavicular triangle; a specimen was taken for biopsy, and the pathology department made a diagnosis of an atypical type of lymphatic pathology, but we felt that the growth was definitely a lymphoblastoma. The patient was sent for irradiation, and the pathology department then said it was not a lymphoblastoma but simply a form of reticulum cell hyperplasia; consequently irradiation was stopped and the patient is well to date.

Dr. Irwin D. Horwitz: There is a growing tendency to group all the lymphomas—whether reticulum cell sarcoma, lymphosarcoma, large cell or small cell—together except the leukemias. The latter have a different course and they do seem to be unicentric. The reason they are thought to be multicentric, perhaps, is that by the time the physician sees the patient the disease is disseminated. This case was unusual in that the patient came to surgery in seven weeks. Most patients go a year or more before they are seen or their disease diagnosed. The disease is painless in most cases, and "watchful waiting" is carried on too long.

There are only three locations in which a lymphoma can be operated on; the neck, the groin, and the mediastinum. Operation on the groin consists of radical dissection along the lumbar aorta. The neck we know about. Operations on lymphomas of the mediastinum have been reported in two series of cases that I have found; one was a series of five, and the other an Army group. These were all fatal within a short time.

The point is that whether surgery or x-ray is used, palliation should not be attempted. Either radical surgery or what the roentgenologists like to call "obliterative x-ray therapy" should be used. The statistics, such as they are, show more cures at the median survival rate,

which, to me, is more important than the average survival rate. The median survival rate in one group of lymphosarcomas was raised from 1.2 to more than 5 years. Half the patients lived more than 5 years, whereas formerly half lived only 1.2 years. That is statistically significant.

Corticotropin (ACTH) in Lethal Granuloma of the Nose and Face: Report of a Case.
Dr. E. W. Hagens, Dr. Normal Parry, and Dr. David Markson.

This case is reported in full in this issue of the Archives, page 516.

DISCUSSION

Dr. Alfred Lewy: Again our Society has scored a notable first; I believe this to be the first case of lethal granuloma cured by any treatment whatsoever. I can record a similar case, also seen by Dr. Hagens when he was my associate at County Hospital. The patient was an 11-year-old girl who, after scarlet fever in March, had a nasoantral window operation done in April. When I saw her in July there were swelling of the face that obliterated the nasolabial fold on the left side and a purulent discharge from the antrum. After a few irrigations I performed a Caldwell-Luc operation. The process continued to progress in spite of all forms of oxidizing agents. Dr. Jaffe and Dr. Fisher, an expert mycologist, thought it was a microaerophilic Streptococcus infection. Inoculations were done on guinea pigs and rabbits; the animals survived, but nodules developed. The nodules from one animal yielded a hemolytic Streptococcus, and in the pus were found rods and Spirilla; from one animal a Blastomyces was recovered. We thought that we did not have conclusive evidence of any particular infection. The pathologic specimens were submitted to several men, including Dr. Davidsohn at Mount Sinai Hospital, and all of them reported simple granuloma.

One interesting feature of this case was that this 11-year-old girl, at the time of death, measured nearly 6 ft. (180 cm.) in length—much larger than either of her parents—and at the time I attributed her growth to pituitary irritation. The lesion had extended into the sphenoid and beyond. She died of uncontrolled hemorrhage. I could not see that anything we did had any effect on the disease.

I reported this case at the meeting of the American Laryngological, Rhinological and Otological Society in 1937, calling the condition gangrenous osteomyelitis. I think the name lethal granuloma is more suitable, and it covers practically all the cases reported.

Dr. George H. Woodruff, Joliet, Ill.: I wish that Dr. Hagens would say a few words about the rationale of the use of corticotropin in this case.

Dr. Thomas C. Galloway, Evanston, Ill.: We know so little about so-called lethal granuloma that we are perhaps not always able to diagnose it. Sometimes confused are microaerophilic or anaerobic streptococcic infections or osteomyelitis which progresses in spite of all that is done.

A patient came to us last year with a granulating lesion involving the right alveolar region and maxilla, with anaerobic sinus infection and osteomyelitis. There was infiltration of the conjunctiva and sclera on the right side. Skin lesions had previously appeared, and a tentative diagnosis of lupus erythematosus disseminatus had been made. We took biopsy specimens from the antrum, which we opened widely by removing the floor by the use of surgical diathermy, and the lesions were diagnosed by our own pathologist as nonspecific granuloma. (Later I found there had been disagreement in the pathology laboratory.) This patient was put on a corticotropin and cortisone regimen, up to 200 mg. a day, and the lesions healed completely except for one area of about 5 mm. The dose was cut down, and the lesions began to recur, granulations increased and there was destruction of the palate. Another biopsy was reported as indicating nonspecific granuloma, and the patient thereafter had little benefit from corticotropin. Dr. Williams saw him and on the basis of biopsy made a diagnosis of probable lymphoepithelioma. Our pathologists now agree that the lesion is a malignant neoplasm, which may be a reticulum cell sarcoma, a lymphoepithelioma, or an undifferentiated carcinoma. The patient is not doing well even with irradiation. I ligated the external carotid yesterday.

The interesting point is that this lesion at one time almost healed with corticotropin therapy. Has there been any such experience with malignant tumors, or is it possible that this is a type

of lesion which secondarily underwent malignant change? It did not metastasize early, but now there are nodes rather extensively involved. This is a puzzling disease, and Dr. Hagens is to be congratulated on his results.

DR. ELMER W. HAGENS: In answer to Dr. Woodruff, many concepts have been advanced in the tremendous literature, the sum and substance being that this condition is to be correlated with allergy, in its widest sense. If it is an allergic condition, its response to corticotropin and cortisone may be logical.

A. G. Rawlins, of San Francisco, in the *Annals of Allergy* for July-August, 1952, says that edema is the main pathologic feature of the allergic state and that clinically allergic edema is located in the gel of connective tissue. The enzyme hyaluronidase liquefies the neutral mucopolysaccharide gel of connective tissue and thus produces edema. Hyaluronidase is present in or around connective tissue at all times. This enzyme is liberated from the damaged tissue in large amounts in allergic inflammation of the skin. Thus in allergic inflammation hyaluronidase is available for the production of allergic edema. In vivo, corticotropin or cortisone neutralizes hyaluronidase and restricts allergic edema. Normally there is an equilibrium in the enzyme action which builds up and breaks down hyaluronic acid. Thus, even while under stress a firm normal connective tissue gel is maintained in nonallergic persons. In an allergic state either there is breaking down of enzyme, overbalancing the building-up enzymes, thus requiring an excess amount of cortisone to maintain equilibrium, or possibly there is dysfunction in the autonomic nervous system and hormonal system in which not enough cortisone is produced to maintain equilibrium.

Rawlins agrees with Williams that many allergic humans form sensitizing antibodies to small amounts of so-called harmless substances. In many the antigen-antibody union produces stress, with tissue damage and edema; in others the same tissue damage and edema will develop from other physical or emotional stress and without the antigen-antibody mechanism. That mechanism is only one specific type stress that produces pathology in allergic humans. Therefore, it is the fact that the condition in the present case is allergy in its broadest sense that gives this treatment its chance. Rawlins has this hypothesis; others say they do not know. All I can say is that this patient has been well for seven months. That may be a relatively short time, but it is remarkable that he has been so well during this time.

Special Reports

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE AND REHABILITATION OF THE AMERICAN MEDICAL ASSOCIATION

AS OF MAY 1, 1953

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Mfr., National Earphone Co., Inc.
20 Shipman St.
Newark 2, N. J.

Audiotone Model 11

Mfr., Audio Company of America
5305 N. Sixth St.
Phoenix, Ariz.

Audiovox Models Super 67 & 70

Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Aurex Models L & M

Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Beltone Mono-Pac Model "Lyric"

Beltone Mono-Pac Model M

Beltone Mono-Pac Model "Rhapsody"

Beltone Symphonette Model

Mfr., Beltone Hearing Aid Co.
1450 W. 19th St.
Chicago 8

Cleartone Models 500 & 700

Cleartone Regency Model

Mfr., American Sound Products, Inc.
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Chicago 5

Dahlberg Model D-1

Dahlberg Junior Model D-2

Dahlberg Model D-3

Dahlberg Model D-4

Mfr., The Dahlberg Company
Golden Valley
Minneapolis 22

Dysonic Model 1

Mfr., Dynamic Hearing Aids, Inc.
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New York 7

Electro-Ear Model C

Mfr., American Earphone Co., Inc.
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New York 17

Fortiphone Models 20A & 21C

Mfr., Fortiphone Limited
Fortiphone House
247 Regent Street
London, W.1, England

Distr., Anton Heilman
75 Madison Ave.
New York 16

Gem Models V-35 & V-60

Mfr., The Gem Ear Phone Co., Inc.
50 W. 29th St.
New York 1

Goldentone Models 25, 69, & 97

Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8

Distr., Goldentone Corporation
708 W. 40th St.
Minneapolis 8

Maico Model J

Maico Quiet Ear Models G & H

Maico Top Secret Model L

Maico UE Atomeer

Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1

Mears (Crystal & Magnetic) Aurophone Model 200

Mfr., Mears Radio Hearing Device Corporation
1 W. 34th St.
New York 1

Micronic Model 303

Micronic Model Mercury

Micronic Star Model
Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Microtone Classic Model T-9

Microtone Models T-10, T-612, & 45
Mfr., The Microtone Company
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St. Paul 1

National Cub Model (C)

National Model D (Duplex)

National Standard Model (T)

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National Ultrathin Model 504

National Vanity Model 506
Mfr., National Hearing Aid Laboratories
106 S. 7th St.
Philadelphia 6

Normatone Model C
Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8
Distr., Normatone Hearing Aid Co.
22 E. 7th St.
St. Paul 1

Otarion Model E-4

Otarion Models F-1, F-2, & F-3

Otarion Models G-2 & G-3

Otarion Model H-1
Mfr., Otarion, Inc.
4757 N. Ravenswood Ave.
Chicago 40

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Paravox Model Y (YM, YC, & YC-7) (Veri-Small)
Mfr., Paravox, Inc.
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Cleveland 15

Radioear All-Magnetic Model 55

Radioear Permo-Magnetic (Multipower)

Radioear Model 62 Starlet

Radioear Model 72

Radioear Model 82 (Zephyr)
Mfr., E. A. Myers & Sons, Inc.
306 Beverly Rd.
Mount Lebanon
Pittsburgh 16
Distr., Radioear Corporation

Rochester Models R-1 & R-2
Mfr., Rochester Acoustical Laboratories, Inc.
117 Fourth St., S. W.
Rochester, Minn.

Silvertone Models J-92 & P-15
Mfr., Johnston Hearing Aid Mfg. Company
708 W. 40th St.
Minneapolis 8

Distr., Sears, Roebuck and Co.
925 S. Homan Ave.
Chicago 7

Solo-Pak Model 99
Mfr., Solo-Pak Electronics Corp.
Linden St.
Reading, Mass.

Sonotone Models 900, 910, 920, 925, 940, & 966
Mfr., Sonotone Corporation
Elmsford, N. Y.

Super-Fonic Hearing Aid
Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
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Televox Model E

Mfr., Televox Mfg. Company
1307 Sansom St.
Philadelphia 7

Telex Models 97, 99, 200, 300-B, 400, 500, 952, 953, & 1700

Mfr., Telex, Inc.
Telex Park
St. Paul 1

Tonamic Model 50

Mfr., Tonamic, Inc.
12 Russell St.
Everett 49, Mass.

Tonemaster Cameo Model

Tonemaster Model Royal

Mfr., Tonemaster, Inc.
400 S. Washington St.
Peoria 2, Ill.

Unex Midget Models 95 & 110

Unex Models 200 & 230

Mfr., Nichols & Clark
Hathorne, Mass.

Vacolite Models J & J-2

Mfr., Vacolite Company
3003 N. Henderson St.
Dallas 6, Texas

Western Electric Models 65 & 66

Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Zenith Miniature 75

Zenith Model Royal

Zenith Model Super-Royal

Zenith "Regent"

Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

(All the accepted hearing devices have vacuum tubes.)

Accepted hearing aids more than five years old have been omitted from this list for brevity.

SEMIPORTABLE HEARING AIDS

Ambco Hearing Amplifier (Table Model)

Mfr., A. N. Brooks Company
684 S. Bonnie Brae St.
Los Angeles 5

Aurex Semi-Portable

Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Precision Table Hearing Aid

Mfr., Precision Hearing Aids
5157 W. Grand Ave.
Chicago 39

Sonotone Professional Table Set Model 50

Mfr., Sonotone Corporation
Elmsford, N. Y.

Abstracts from Current Literature

Ear

PRIMARY TUBERCULOSIS OF THE EAR. J. P. DEREYNIER, Pract. oto-rhino-laryng. **15**:1, 1953.

The author reviews the pathogenesis and diagnosis of tuberculosis of the ear. He believes that because of the influence of the antibiotics there are many atypical cases of mastoiditis due to nonspecific infections, and these disorders are difficult to distinguish, both in their clinical course and pathologic findings, from definite specific infections. He advises that all granulations and secretions from the mastoid cavity be examined histologically and bacteriologically in order to establish the exact diagnosis. On the other hand, he believes that the Koch bacillus reaches the middle ear by way of the lymphatic channels of the Eustachian tube from some localized primary focus in the pharyngeal region. Hence any tuberculous involvement of the middle ear or mastoid is a secondary phenomenon arising from some active, primary pharyngeal focus. He terms these cases primosecondary middle ear tuberculosis.

PERSKY, Philadelphia.

SYNDROMES OF DEAFNESS. A. VASSALLO DE MUMBERT, Acta otorrinolaring. españ. **3**:276 (April-May-June) 1952.

In this monogram on deafness de Mumbert presents so extensive and detailed a discussion that it may be considered a splendid textbook on the subject. In the first section his first chapter deals with the anatomy and histology of the mechanism of audition. Details of this subject are clearly and simply stated and well illustrated by line drawings. The second chapter deals with the theories of audition and the electrophysiology of the ear. This is presented as a historical evolution of the various theories and brought up to date with the newest concepts of the mechanism of hearing. The third chapter deals with the various forms of hearing tests, their problems, and their significance. Included is the question of speech perception with the speech interpretation particularly applied to the Spanish language. Also included in this chapter are discussions on chronaximetry, psycholgalvanometry, and sphygmoaudiometry.

The second section deals essentially with pathologic conditions. In the first chapter the author discusses the general problems of deafness, either the conductive or the perceptive type. The second chapter deals with the conductive deafness due to auricular malformations, such as malformation of the auditory canal and embryonic dysphasias. Conductive deafness of tubal origin is the topic of the third chapter, in which he indicates and discusses the various forms of tubal diseases and malformations that may influence the hearing acuity. Chapter four deals with conductive deafness due to ankylosis—either tympanosclerosis, postinfectious tympanofibrosis, or rheumatic tympanoankylosis. The fifth chapter deals with otospongeous deafness, namely, otosclerosis. In this chapter de Mumbert discusses the problem of fenestration, the technique of the operation, postoperative care and problems, prognosis, etc. Perceptive deafness due to toxic neurosis of the eighth nerve is the subject of the sixth chapter. Chapter seven deals with congenital perceptive deafness or deafmutism. The eighth, ninth, tenth, and eleventh chapters deal with perceptive deafness due to labyrinthitis, neuroencephalic conditions, functional disturbances, and senile deafness. The twelfth chapter discusses occupational deafness; chapter thirteen, psychogenic deafness.

The third section of this monogram deals with two problems: first, the various types of hearing aids, and second, the organization of suitable agencies, studies, and research problems on the question of prevention of deafness. There are an extensive bibliography, a splendid index, and numerous line drawings to illustrate the various points under discussion. This monogram should be translated into the English language, for it truly presents a comprehensive discussion in a concise and clear-cut fashion on the subject of deafness with all its implications.

PERSKY, Philadelphia.

FUNCTIONAL MICROSURGERY. L. GARCIA IBANEZ, Acta oto-rino-laring. Ibero-Am. **3**:357, 1952.

The author discusses the various surgical techniques and believes that the modern antibiotics and the improved surgical technique developed by Lempert have opened up a wide field of surgical procedures in chronic mastoid surgery. Today three objectives are considered: (1) the elimination of the danger of any intracranial complications, (2) the control of infection and suppuration, and (3) the maintenance or the improvement of preoperative hearing acuity. He describes the various types of operations and their indications, favoring the modified radical of Bondy for infection limited to the attic and antrum. The author also discusses the radical mastoidectomy and the problem of performing a fenestration for the improvement of hearing either at the time of initial radical mastoidectomy or after a stapedectomy or the complete cicatrization of the cavity. He gives his reasons for using either the one-stage or the two-stage operation and believes that when there exists a profound bilateral deafness and poor cochlear function in the ear operated upon only two objectives should be considered, namely, to decrease the danger of intracranial complication and to control the infection.

PERSKY, Philadelphia.

TREATMENT OF MÉNIÈRE'S DISEASE WITH CERVICAL SYMPATHETIC BLOCK. C. A. HOAGLAND, Acta oto-laryng. **42**:379 (Aug.-Oct.) 1952.

After a very careful otologic examination which establishes with accuracy the diagnosis of Ménière's disease, the authors proceed to check the effectiveness of cervical sympathetic block, using procaine stellate ganglion block. They record the results in 37 patients who had not responded to standard medical therapy. Of this group, 60% showed permanent improvement, 19% were temporarily relieved, and 21% did not respond. On the basis of these results they advise stellate ganglion block in all cases of Ménière's disease not relieved by medical treatment before destructive procedures such as labyrinthectomy are attempted.

LEWY, Chicago.

Pharynx

A HYDATID CYST OF THE FLOOR OF THE MOUTH. PEDRO L. ERRECART and JOSE M. CASTILLO MORALES, Acta oto-rino-laring. Ibero-Am. **3**:318, 1952.

The authors report a case of a swelling of the floor of the mouth of a 12-year-old child, in whom the mother noted a sense of obstruction to eating and to talking for four months. Under the tongue was a tumor which increased in size without pain. The initial diagnosis was a ranula. However, on extirpation it was found to be a hydatid cyst on the floor of the mouth. The patient made an uneventful recovery.

PERSKY, Philadelphia.

NEW THERAPEUTIC CONCEPT AND NEW AVENUES OF APPROACH TO NASOPHARYNGEAL TUMORS. MARIO RIUS, An. oto-rino-laring. Uruguay **22**:43, 1952.

Rius discusses the various types of malignant tumors of the nasopharynx. He evaluates the various types, their sites, associated symptoms, complications—particularly metastasis—and, lastly, the various forms of surgery. In conclusion, he believes that epithelioma is definitely more frequent than sarcoma. In most of the cases it invades the base of the cranium. Invasion of the dura mater is a very late stage. These tumors usually grow to a very large size. Cervical adenopathy is very frequent, but visceral metastasis is rare.

The percentage of patients cured by any method of treatment over a five-year-period is relatively low, between 22 and 25%. Roentgen therapy does not cure the tumors that have involved the bone by contiguity. As to therapeutic indications he believes that for primary malignant tumors which do not involve the base of the cranium, roentgen therapy is indicated. In those epitheliomas which involve the base of the brain but do not have any effect or alteration in the cerebrospinal fluid, surgery is indicated with resection of the involved bone in addition to application of radium *in situ* and roentgen therapy. The surgical procedure may vary with the different localizations of the tumor and the transpalatine approach of Ruddy, the transmaxillo-

facial approach of DeMoure, or the transzygomatic approach inaugurated by Rius should be used. For secondary malignant tumors roentgen therapy or surgery, depending upon the radio sensitivity of the tumor, is recommended.

In this presentation the author describes in detail his modification of the transzygomatic approach, which was originally described by Gutierres.

PERSKY, Philadelphia.

Larynx

DIAGNOSIS IN CANCER OF THE LARYNX. HAYES MARTIN, New York J. Med. **53**:159 (Jan. 15) 1953.

Martin specifies three important manifestations of laryngeal cancer: hoarseness, mild dysphagia, and cervical metastases. Most patients with persistent hoarseness will consult the physician within six weeks. This is the critical period, during which an early diagnosis can be made, but, unfortunately, it is often missed. If the diagnosis is not made within the first six weeks, the average time before cancer of the larynx is diagnosed is 10 months. It is a safe rule that any patient with hoarseness lasting more than two weeks should have a thorough examination of the larynx, including a biopsy if a growth is present. Simple mirror examination of the larynx may be sufficient, but direct laryngoscopy is always necessary if a biopsy is to be done.

A "lump in the neck" is not always due to an infected tonsil or to carious teeth. Asymmetric enlargement of a lymph node on one side of the neck should always suggest the possibility of cancer. Common errors by physicians concerning patients with one of the symptoms of larynx cancer are (1) to assure the patient that all is well and that no treatment is necessary; (2) to remove tonsils or to extract teeth on the supposition that the enlarged cervical lymph node is inflammatory; (3) to "rub in something" to reduce the swelling, and (4) to excise the "lump in the neck" without searching in the mouth, pharynx, and larynx for a primary lesion.

Conditions to be considered in differential diagnoses are the following: benign polyps, pachyderma, papilloma, tuberculosis, syphilis, and globus hystericus. Any of these combinations may coexist with cancer. In doubtful cases, it is the responsibility of the first doctor consulted to see that a biopsy is performed, either by himself or by a qualified consultant.

ABSTRACTER'S COMMENT: It is the bounden duty of every physician to avoid diagnosing a hoarse voice as simple laryngitis and "due to a cold." A dependable examination with a laryngeal mirror is sometimes difficult, but in every case of hoarseness there must be at least a mirror examination and, possibly, direct (tube) laryngoscopy.

I. W. VOORHEES, New York.

A NEW HOME TREATMENT FOR EARLY CASES OF "CROUP." R. J. MEHR, New York J. Med. **53**:568 (March 1) 1953.

Acute infections of the larynx, trachea and bronchi are seen more frequently in homes than in hospitals. The child who has been sleeping quietly suddenly awakens with a brassy cough, stridor, hoarseness and dyspnea. His temperature is seldom much above normal in the early stages, but he is frightened, cries fearfully, and instils great dread in those about him. The condition is seldom fatal, but asphyxia, of course, could occur. The next day may be uneventful, but recurrence takes place at night, and the cycle repeats from three to five days. Mehr gives 450,000 units of penicillin with 10 mg. of diphenhydramine (Benadryl) hydrochloride (by hypodermic injection); chloramphenicol (capsules or suspension), 50 mg. per kilogram of body weight, is given without fail every six hours around the clock by the attendant, awakening the child if necessary. Because of unfavorable reports of the latter drug on the blood, Mehr has substituted oxytetracycline (Terramycin) or aureomycin with equally good results: (1) laryngeal stridor is reduced miraculously (often within five minutes); (2) diphenhydramine calms the child and induces sleep; (3) penicillin works at once to hold back the infection until the natural resources of the body overcome the invader, and (4) the chloramphenicol, oxytetracycline, or aureomycin carry on after penicillin has tapered in value. The report is based on eight cases with no untoward effects.

ABSTRACTER'S COMMENT: This is a simple, easy method of managing an emergency, reducing the fear of parents and child, and possibly avoiding an urgent tracheotomy in certain cases.

I. W. VOORHEES, New York.

THE USE OF TRACHEOTOMY IN THE TREATMENT OF CRUSHING INJURIES OF THE CHEST. B. N. CARTER and J. GIUSEFFI, Surg., Gynec. & Obst. **96**:55 (Jan.) 1953.

In any case of severe crushing injury of the thorax, certain factors are involved which operate to reduce respiratory reserve. These are (1) paradoxical movement of the chest wall, which interrupts the efficiency of the chest bellows; (2) severe pain arising from the movement of fractured ribs, which further impairs attempts at increased respiratory effort, and (3) copious tracheobronchial secretions, which may result immediately from parenchymal injury of the bronchi or lung or may develop later in the "wet lung" syndrome. In either instance, the effect is the same, namely, to reduce satisfactory aeration.

The authors present experimental and clinical evidence, both in animals and in man, to show that improvement in respiratory physiology from tracheotomy is associated with two fundamental changes: (1) a reduction in volume of dead space involved in the respiratory act, i. e., that of the nasal passages, mouth, pharynx, and tracheobronchial tree, and (2) a decrease in resistance to the inspired and expired air.

Thus, in the normal subject with a tidal air of 500 cc. or more, the presence of a dead space of roughly 150 cc. is tolerated without difficulty. This dead space in no way contributes to ultimate oxygenation and represents unnecessary work. In a person with a crushing chest injury, the tidal air was shown to be reduced to 350 cc., with 150 cc. representing dead space and 200 cc. representing effective ventilation. In the same patient after tracheotomy the dead space was estimated at 50 cc. and the effective ventilation at 300 cc.

The second important physiological alteration which takes place with tracheotomy is a profound reduction in resistance to breathing. After tracheotomy, the intratracheal pressure variations that occur with breathing are practically nil and the intrapleural pressure oscillations are roughly reduced one-half. These facts become increasingly important in the case of a person with embarrassed respiratory function.

In reporting the detailed management of 11 patients with crushing injuries of the thorax, the authors favor tracheotomy as the primary form of therapy. Its effectiveness is the result of (*a*) reduction in dead space, (*b*) reduction in resistance to breathing, (*c*) stabilization of loose segments of the thoracic wall, and (*d*) accessibility to the tracheobronchial tree for aspiration of retained secretions.

FRIEDBERG, Chicago.

THE VALUE OF TRACHEOTOMY IN ACUTELY ILL SURGICAL PATIENTS. E. M. COLVIN and W. M. MORRISON, Surg., Gynec. & Obst. **96**:338 (March) 1953.

The authors outline the various surgical conditions, exclusive of carcinoma of the larynx and emergency procedures, for which tracheotomy may be of value. These include acute cerebral injuries when the patient is comatose and cannot clear his tracheobronchial tree by coughing; severe and massive injuries about the head and neck when the danger of aspiration is present; all penetrating and severe crushing injuries to the trachea; certain surgical procedures about the head and neck involving the tongue or mandible; an ineffective cough in postoperative patients whose secretions are inadequately cleared by intratracheal suction or bronchoscopy; advanced pulmonary disease in patients undergoing major surgery, and, finally, respiratory obstruction complicating thyroid surgery. A plea is made for prompter use of tracheotomy in patients with conditions falling into these categories.

FRIEDBERG, Chicago.

THE TREATMENT OF ACUTE LARYNGITIS IN THE INFANT WITH THE ANTIHISTAMINICS. RAFAEL DE LA PORTILLA, Rev. cubana Oto-rino-laring. **111**:41 (Jan.) 1953.

The author discusses the problem of acute laryngitis in infants and young children. He presents a typical picture of the disease with all its serious complications. In reviewing the various therapeutic measures he believes that many of these patients can be benefited by the

intensive use of the antihistaminics. This is particularly true in the case of laryngitis which is not due to diphtheria. He uses a number of antihistaminic drugs. For the child of 2 to 4 years of age he gives 50 mg. of diphenhydramine (Benadryl) tripelennamine (Pyribenzamine) every four hours for 2 doses; then he gives 25 mg. every four hours until there is a complete improvement in the symptomatology. In children 6 months to 2 years of age he gives 25 mg. every four hours for 2 doses and then 25 mg. every six hours. He has not had occasion to continue the medication for more than 48 hours. For a few patients he had to supplement the treatment with the antibiotics and vapor therapy, particularly when there were signs of an acute bronchial infection. He has observed that (1) this form of therapy has produced a rapid disappearance of obstructive symptoms and converted the entire picture into a simple tracheobronchitis, which was easily treated by steam inhalation; (2) there were no late complications, such as pulmonary atelectasis and pneumonic foci; (3) the time of hospitalization was markedly reduced (all his patients left the hospital within two days, except one patient who remained for three days) and (4) there was not a single instance in which surgical intervention was necessary.

PERSKY, Philadelphia.

Nose

COMPLICATIONS OF NASAL DIPHTHERIA TREATED WITH MASSIVE DOSES OF STRYCHNINE. P. GIRAUD, R. BERNARD, and P. ALLIES, Presse méd. **59**:609 (May 5) 1951.

Nasal diphtheria developed in a child of 6 years during convalescence from measles. Renal damage quickly appeared, shown by albuminuria and edema. Treatment was adequate with antidiphtheritic serum and large doses of penicillin. Tachycardia, which was considered to be due to a preceding rheumatic infection, was present. The electrocardiogram showed inverted T and P waves in leads D II and D III. With salicylate treatment, the temperature subsided and the gallop rhythm disappeared. The following day purpura developed, and on the next day the boy had a clouded sensorium, a left facial paralysis, increased deep reflexes, and pharyngeal paralysis. The authors decided to try strychnine for this desperate condition, and, starting with small amounts, increased the dose rapidly to 150 mg. through the day. The dose was continued at this high level for 10 days, when tetanic spasms appeared. The dose was reduced, and the boy recovered totally.

DAFFINEE, Melrose, Mass. [A. M. A. Am. J. Dis. Child.].

EPISTAXIS OF ENDOCRINE ORIGIN. ANTONIO MARIA HARAN, An. Soc. mex. oto-rino-laring. **3**:83 (April-June) 1952.

Haran discusses a form of epistaxis which he believes is associated with endocrine disturbances. As a rule, the bleeding is minimal and does not produce any serious complications, endanger the patient's life, or present a surgical problem. The nasal condition usually accompanies a red, congested nose, but there may be congestion without epistaxis and, contrariwise, epistaxis without any marked congestion. These episodes of epistaxis in women as a rule are not associated with any changes in the menstrual cycle, such as have been formerly noted in cases of either the compensatory or the vicarious type of epistaxis. The author's concept is that there is an excess genital hormone which produces the epistaxis and congestion of the nose, and in consequence he administers the male hormone to the female patients and the female hormone to the male patients. He also emphasizes the fact that in all the cases under consideration a close correlation and collaboration should be established between the otorhinologist and the endocrinologist.

PERSKY, Philadelphia.

Miscellaneous

AN UNUSUAL CASE OF UNILATERAL EIGHTH NERVE TUMOR. V. H. MARK and W. H. SWEET, J. Neurosurg. **9**:395 (July) 1952.

The occurrence in the younger age group of bilateral acoustic tumor, or acoustic tumor associated with Recklinghausen disease, or neurofibromatosis, is well known. Cushing stated that "a patient under 20 with a cerebellopontile-angle syndrome in all likelihood has a lesion other than an acoustic tumor."

The case of unilateral acoustic nerve tumor presented by the authors proves to be an exception to that rule, for the age of onset was 6 years and the neuroma was removed and the diagnosis verified histologically when the boy was 8½ years old. Furthermore, the patient showed none of the associated stigmas of Recklinghausen disease, as determined either by physical examination or from the family history. Other unusual features of this case include normal spinal fluid protein and massive destruction of the pyramid of the involved petrous bone.

ALPERS, Philadelphia [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

ROENTGEN THERAPY IN LYMPHADENOSIS AND SINUSITIS IN CHILDHOOD, WITH 10-YEAR FOLLOW-UP OF 349 CASES. HAROLD LEVY, J. Pediat. **39**:223 (Aug.) 1951.

Levy states that infected and hyperplastic tonsils and adenoids should be removed by surgery when possible. There remains, however, a group of conditions of the nasopharynx in which x-ray therapy (not radium) is the treatment of choice. In general, x-ray therapy for treatment of infected or hypertrophic lymphatic tissue in the nasopharynx is indicated for very young children, for children with Eustachian tube obstruction, in sinusitis, when antibiotics have failed, in the child with cardiac or other chronic disease, in the "non-allergic" asthmatic patient, and in the presence of active infections or epidemics of poliomyelitis.

Levy advises small x-ray doses. In a large series of cases over a period of years he has had no ill effects from treatment. His results were good to fair in 88% of cases.

The treatment is controversial.

MACDONALD, Pittsburgh [A. M. A. AM. J. DIS. CHILD.].

ORAL TUMORS. C. G. DARLINGTON, New York J. Med. **51**:61 (Jan. 1) 1953.

Basic studies of oral tumors were made at the New York University College of Dentistry by dentists, who now are recording more and more tumors of the mouth, with accurate diagnoses. Seven thousand specimens, whole tumor or biopsy, including 300 malignant neoplasms, were examined. The benign growths were granulomata, simple hypertrophies, epulii, polypi, cysts, and papillomas. The time covers 26 years of observation, beginning with the year 1926. New Jersey is said to be one of the first states to inaugurate teaching facilities under the State Department of Health for dentists to recognize oral tumors.

Tumors of bone, palate, and jaws are common but not always malignant. The author is "impressed with the extreme rarity of connective tissue malignancies in the mouth." He quotes the late Dr. James Ewing, who stated that "although many of the lesions were osteogenic in character, they were very low-grade in malignancy."

"Males are most frequently affected by squamous-cell carcinoma. Sarcoma is thought to be 'rare.'" ". . . epithelial rather than connective tissue changes deserve more consideration."

Four statistical tables show the results of tissue examinations.

I. W. VOORHEES, New York.

EOSINOPHILIC GRANULOMA. MARSHAK, Harefuah **43**:173 (Dec.) 1952.

A 5-year-old boy was admited to a hospital Jan. 8, 1952. Six weeks before admission he began to complain of pain in the region of the bridge of his nose. A short time afterward a swelling appeared in this region and remained about a week. It reappeared after four weeks. At the same time a swelling was noted in the region of the vertex of the skull, near the region of the anterior fontanel. The general condition of the child was good; there was no febrile rise. Upon his admission a small swelling was found near the bridge of the nose. The edges of the swelling were not well delimited. A defect in the bone could be felt in the center of the swelling. Another swelling was found in the region of the anterior fontanel; it was a little larger. Roentgenograms showed defects in the skull bones, about 2 cm. in diameter in the region of swelling. No bony defects were found in other parts of the skeleton. The blood cell count showed 2.3% eosinophiles. Operation, on Jan. 17, 1952, showed an eosinophilic granuloma at each site; the destruction of bone in the region of the anterior fontanel extended to the dura. Histologic study of the curetted bone was reported as revealing an eosinophilic granuloma. Some histiocytes were noted, in addition to the eosinophilic polymorphonuclear leucocytes. Both these lesions

disappeared with x-ray therapy. On March 4 a swelling and bone defect were noted in the region of the left mastoid. This bone defect cleared up completely with x-ray therapy alone. Follow-up examination seven months after the child was first seen showed complete recovery. Since Jaffe and Lichtenstein described this lesion in 1940, there has been considerable difference of opinion as to whether it is a distinct clinical entity or whether it is related to Hand-Christian-Schüller disease or Letterer-Siwe disease. The author does not express his own opinion.

SAVITSKY, New York [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

CLINICAL PROBLEMS OF SYMPATHETIC AND SEPTIC MENINGITIS. ARTURO TELLO T., Rev. otorrinolaring. (Chile) **12**:35 (Sept.) 1952.

The author discusses sympathetic meningitis. This apparently has a focus of infection in either the ears or the sinuses. This infection may be latent either because of the use of antibiotics or the presence of pneumococcic organisms. Manifestations are slow to appear, and the entire clinical picture is often very difficult to differentiate from that of tuberculous meningitis. Studies of the sinuses, including roentgen interpretation, are not very conclusive. Surgical exploration of these sinuses also is not very reliable. The cerebrospinal fluid examination provides the best index to its diagnosis. The author feels that the mere presence of a septic focus in the sinuses or in the ears is not sufficient to account for this reactive meningitis. He believes that there must be, in addition, some neurovascular changes in the arachnoid and in the brain which increase the vascular permeability and thus cause infection in this area. He reports on a series of patients with this sympathetic or reactive meningitis who improved with the eradication of the foci in the sinuses and the administration of antibiotics.

PERSKY, Philadelphia.

ACRYLIC IMPLANTS IN PLASTIC SURGERY. ORLANDO LESCANO Y GARAIZAR, Rev. cubana oto-rino-laring. **1**:41 (Oct.) 1952.

The author has been using acrylic implants with marked success in a series of patients with nasal and facial deformities. He believes that acrylic resin is very simple to prepare, produces less local reactions, and produces better permanent results than any other form of implant that is more commonly used.

PERSKY, Philadelphia.

Directory of Otolaryngological Societies *

FOREIGN AND INTERNATIONAL

Canadian Otolaryngological Society
(Société Canadienne d'Otolaryngologie)

President: Dr. D. E. S. Wishart, 170 St. George St., Toronto.
Secretary: Dr. W. Ross Wright, 361 Regent St., Fredericton, N. B.
Place: Minaki Lodge, Minaki, Ont. Time: June 14-18, 1953.

Fifth International Congress of Oto-Rhino-Laryngo-Broncho-Esophagology

Place: Amsterdam. Netherlands. Time: June 8-13, 1953.
President: Prof. Dr. Eelco Huizinga.
General Secretary: W. H. Struben, Viottastraat 1, Amsterdam-Z
Scientific Secretaries: Dr. J. Bijtel and Dr. P. G. Gerlings.

International Bronchoesophagological Society

President: Dr. Fernand Eeman, Ghent, Belgium.
Secretary: Dr. Chevalier L. Jackson, 1901 Walnut St., Philadelphia 3.
Meeting: Second International Congress of Bronchoesophagology.
Place: Albert Plage, Le Zoute, Belgium. Time: June 15-16, 1953.

International Congress of Audiology

Place: Leyden, Netherlands. Time: June 5-6, 1953.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland

International Course in Paedo-Audiology

Place: Groningen, Netherlands. Time: June 1-4, 1953.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

Pan American Association of Oto-Rhino-Laryngology and Broncho-Esophagology

Meeting: Fourth Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology.
Place: México, D. F., Mexico. Time: Feb. 28-March 4, 1954.
President: Dr. Justo Alonso.
Exec. Secretary: Dr. Chevalier Jackson, 1901 Walnut St., Philadelphia 3.
President of Congress: Dr. Ricardo Tapia Acuna.

Third Latin-American Congress of Otorhinolaryngology and Bronchoesophagology

Place: Caracas, Venezuela. Time: Feb. 21-25, 1954.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Dean Lierle, Iowa City.
Secretary: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis 3.
Place: San Francisco.

American Academy of Ophthalmology and Otolaryngology

President: Dr. James Milton Robb, 315 Lakeland Ave., Grosse Pointe 30, Mich.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100-1st Ave. Bldg., Rochester, Minn.
Place: Palmer House, Chicago. Time: Oct. 11-17, 1952.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

American Board of Otolaryngology

President: Dr. LeRoy A. Schall, 243 Charles St., Boston.
Secretary-Treasurer: Dr. Dean M. Lierle, University Hospitals, Iowa City.
Place: Roosevelt Hotel, New Orleans. Time: April 21-25, 1953.

American Broncho-Esophagological Association

President: Dr. Fred W. Dixon, 1027 Rose Bldg., Cleveland.
Secretary: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore 1.
Place: Roosevelt Hotel, New Orleans. Time: April 28-29 (afternoons only).

American Laryngological Association

President: Gordon F. Harkness, 215 Main St., Davenport, Iowa
Secretary: Dr. Harry P. Schenck, 326 S. 19th St., Philadelphia 3.
Place: Hotel Statler, Boston. Time: May 20-21, 1954.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Francis E. LeJeune, 49 Audubon Blvd., New Orleans 18.
President-Elect: Dr. LeRoy A. Schall, 243 Charles St., Boston.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.
Place: Roosevelt Hotel, New Orleans. Time: April 28-30, 1953 (mornings only).

SECTIONS:

Eastern.—Chairman Dr. Irl H. Blaisdell, 1100 E. Genesee St., Syracuse 10, N. Y.
Place: Hotel Syracuse, Syracuse, N. Y. Time: Jan. 7, 1953.
Southern.—Chairman: Dr. W. W. Wilkerson, Jr., Curtiswood Lane, Nashville 4, Tenn.
Place: Andrew Jackson Hotel, Nashville, Tenn. Time: Jan. 12, 1953.
Middle.—Chairman: Dr. Henry L. Williams, 818 4th St., S. W., Rochester, Minn.
Place: The Drake, Chicago. Time: Jan. 19, 1953.
Western.—Chairman: Dr. Alden H. Miller, 4000 Woking Way, Los Angeles 27.
Place: The Elks Club, Los Angeles. Time: Jan. 24, 1953.

American Otological Society, Inc.

President: Dr. Frederick T. Hill, Professional Building, Waterville, Maine
Secretary-Treasurer: Dr. John R. Lindsay, 950 E. 59th St., Chicago.
Place: Boston. Time: May 16-17, 1954.

American Otorhinologic Society for the Advancement of Plastic and Reconstructive Surgery, Inc.

President: Dr. Benjamin H. Shuster, 1824 Pine St., Philadelphia.
Secretary: Dr. Louis Joel Feit, 50 Park Ave., New York 16.

American Society of Ophthalmologic and Otolaryngologic Allergy

President: Dr. Kenneth L. Craft, 23 E. Ohio St., Indianapolis.
President-Elect: Dr. Albert D. Reudemann, 1633 David Whitney Building, Detroit 26.
Secretary-Treasurer: Dr. Michael H. Barone, 468 Delaware Ave., Buffalo 2.
Place: Palmer House, Chicago. Time: Oct. 16, 1953.

Announcing a scientifically significant development in cigarette smoking...

KENT

with the exclusive "MICRONITE" FILTER

DOCTORS have long been aware of the need for a really effective filter-tipped cigarette. P. Lorillard Company has been conscious of this problem, and after years of study, experiment and research believes it has developed a cigarette that meets the need.

It is the new KENT cigarette with the "Micronite"* Filter. Recent tests have shown that the Micronite Filter *approaches 7 times the efficiency of other filters in the removal of tars and nicotine* and is virtually twice as effective as the next most efficient cigarette.

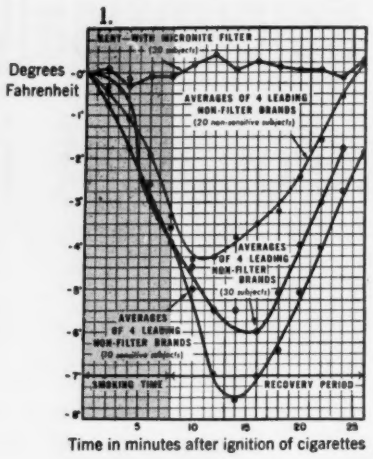
All members of the medical profession will be interested in the facts about this new cigarette. To avoid possible confusion or misunderstanding by the general public, the details of the KENT studies given on these pages are for physicians only, and will not appear in KENT advertising or promotion to the general public.

Micronite as a cigarette filter...

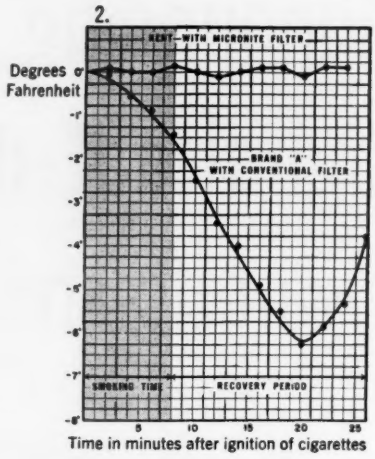
The new filter material—called Micronite—stems directly from the improved protective filters developed to meet critical air-purification problems in atomic energy plants.

When investigations showed that this filter medium was capable of removing all of the minute particles from a stream of cigarette smoke, the filter was modified for use in KENT cigarettes. *This was done in such a way as to permit the passage of pleasant aromatic smoke constituents, but with a removal of the more objectionable fractions of tobacco*

*PATENT APPLIED FOR



1. Comparison of KENT with leading non-filter brands. Effects on Peripheral Vascular System. Drop in surface skin temperature at the last phalanx induced by smoking one cigarette.



2. Comparison of KENT with Brand "A" conventional filter tip. Effects on Peripheral Vascular System. Drop in surface skin temperature at last phalanx induced by smoking one cigarette. Average for 15 susceptible subjects.

smoke to an extent never before accomplished.

Efficacy of the Micronite Filter

The normal human subjects used in testing the Micronite Filter were divided into two categories—*susceptible and non-susceptible*—on the basis of their subjective reactions to cigarette smoking. Approximately two-thirds of the subjects *in this investigation* were *non-susceptible* while the remaining third were definitely *susceptible.* Other investigations have reported a somewhat similar ratio. (a)

To study the effects of this filter on physiological reactions to cigarette smoke, in both *susceptible and non-susceptible persons,* two different tests were employed, both being measurements of peripheral blood flow.

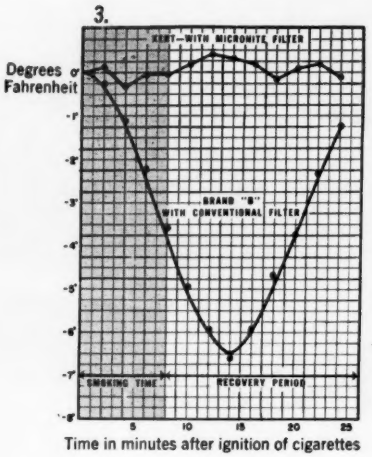
The first test involves the drop in skin temperature occurring at the finger tip, induced by smoking and measured according to *well-established procedures.* (b, c)

The second test is a measurement of vasoconstriction in the hand, as recorded plethysmographically. (d)

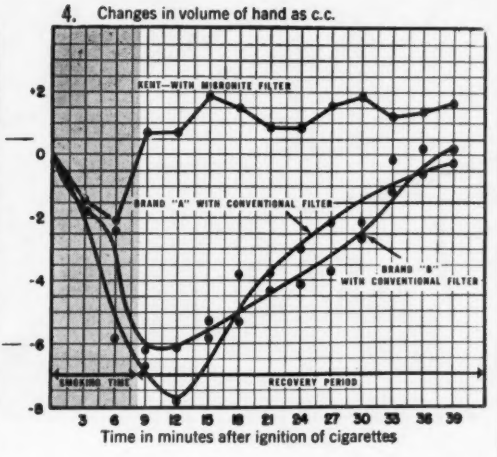
The results of these measurements—determined for Lorillard by an independent research organization—are shown on the four charts reproduced here. Concurrently, other outside independent laboratories are carrying on further research on the chemical and physiological effects of cigarette smoking *with new and original testing methods.*

PHYSICIANS:

Today, KENTs are sold in most major U.S. cities. If your city is not yet among them, simply write to P. Lorillard Company, 119 West 40th Street, New York, N. Y., and special arrangements will be made to assure you of a regular supply.



3. Comparison of KENT with Brand "B" conventional filter tip. Effects on Peripheral Vascular System. Drop in surface skin temperature at the last phalanx induced by smoking one cigarette. Average for 15 susceptible subjects.


4. Changes in volume of hand as c.c.
KENT—WITH MICRONITE FILTER
BRAND "A" WITH CONVENTIONAL FILTER
BRAND "B" WITH CONVENTIONAL FILTER
SMOKING TIME
RECOVERY PERIOD
Time in minutes after ignition of cigarettes

4. Comparison of KENT with Brand "A" and "B" conventional filter tip. Peripheral vasoconstriction induced by smoking one cigarette. Peripheral blood flow as measured by continuous plethysmography on the hand. Average for 4 susceptible and 8 non-susceptible subjects.

From these charts, the following general conclusions may be drawn:

When cigarette smoke is drawn through a Micronite Filter, it is no longer capable of producing characteristic changes in peripheral blood flow in either *susceptible or non-susceptible persons.*

The Micronite Filter is vastly superior to *any other available filter now in use* for removing tars and nicotine in cigarette smoke.

Here are additional observations from work now in progress:

1. When smoke which has passed through a Micronite Filter contacts the conjunctival sac of the rabbit, far less irritation occurs than when the sac is exposed to the smoke from regular cigarettes or the smoke from popular filter-tipped brands.

2. Current studies also indicate that Micronite-filtered smoke is less irritating to mucous membranes than unfiltered smoke.

When the scientific evidence of the effectiveness of the Micronite Filter is compared *with* the effectiveness of other filters, *it shows that*—

The problem of smoker susceptibility to tobacco irritants may be largely overcome by KENTs. And for those people whose smoking should be restricted for therapeutic reasons, *KENT should be considered as the cigarette of choice.*

P. Lorillard Company will gladly send you a booklet, prepared especially for the medical profession, which describes more fully the investigational work on the chemical and physiological advantages of the new Micronite-filtered KENT cigarette.

References Cited

a. *A Manual of Pharmacology*, 7th edition, Philadelphia, W. B. Saunders Co., 1949, pp. 341-352.
b. *J.A.M.A.*, Vol. 103, 1934, p. 318.
c. *J.A.M.A.*, Vol. 135, 1947, p. 417.
d. *J.A.M.A.*, Vol. 104, 1935, p. 1963.

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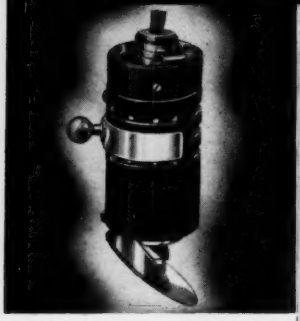

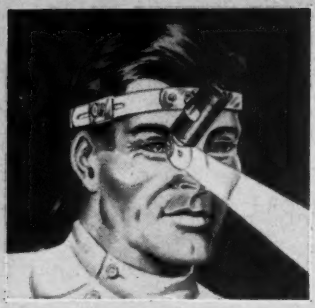

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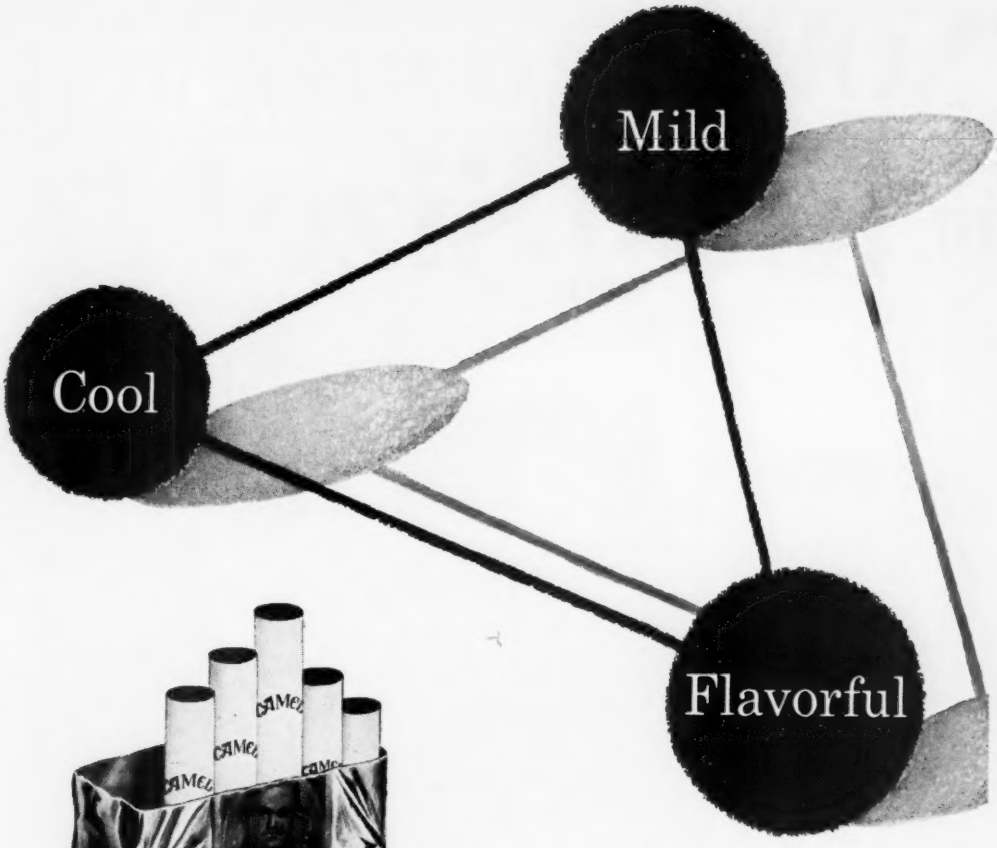

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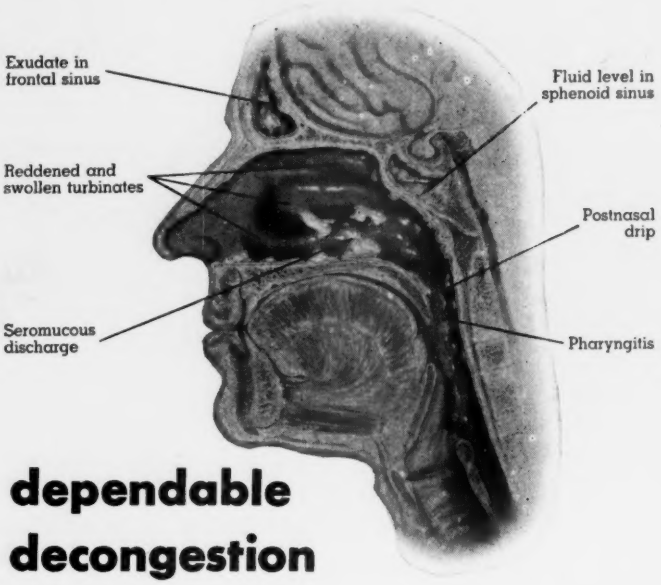

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